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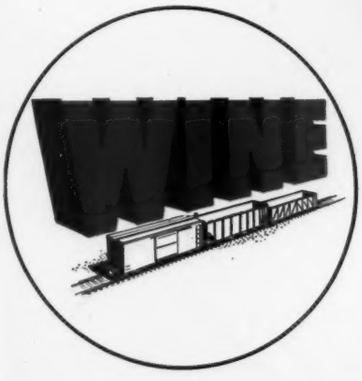

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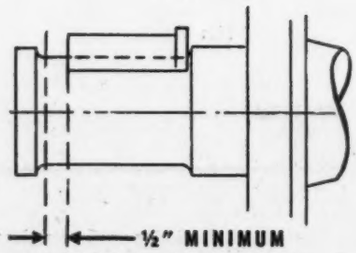

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RAILWAY Mechanical and Electrical Engineer

Helical Thread Inserts Help Speed Up Motor Repairs

Next to the repaired hole are the broken-off tang and an unmounted thread insert

HELICAL-wire thread inserts are speeding the repair of worn or stripped threads in the maintenance shops of a large eastern railroad. These repair operations are performed on electric and diesel-electric locomotives and multiple-unit cars where thread repair operations were formerly a costly and time-consuming problem. Savings in time resulting from the use of the wire-insert thread repair method amount to as much as 80 per cent as compared with methods previously used.

This maintenance shop has hte job of keeping over 70 multiple-unit motor cars in running order. uring the past two years, over 300 thread-repair jobs have been made in these shops using stainless steel Heli-Coil thread inserts. There is no record of a thread repaired with these inserts having stripped, pulled out, or shown any appreciable deterioration.

Typical repairs by this method include the replacement of damaged threads and broken studs in traction-motor bases, motor-housing cover plates, and quill-spring drive assemblies. Threads repaired are from ½ to 1½ in.

Wire-insert thread repair operations follow this pattern: (1) the damaged thread is cleaned out with a drill slightly larger in diameter than the major diameter of the original thread; (2) the hole is retapped with standard Heli-Coil roughing and finishing taps; and (3) a stainless steel Heli-Coil thread insert is installed, bringing the hole back to original size.

Of four possible thread repair techniques that can be employed to replace damaged threads—the oversize-thread method, the build-up by weld method, the solid-bushing method, and the wire-insert method—the latter has proved itself to be the most efficient in its consumption of time, labor, and materials, and the most effective in producing a more wear-resistant repaired thread.

The first technique, the oversize-thread method, is considered undesirable because of its space consumption, its need for using larger and more expensive bolts or studs, and its need for larger clearance holes in mating parts.

The second technique, the build-up by weld method is tedious, time-consuming and wasteful in its use of manpower and material handling equipment. It requires the following operations on parts having damaged threads: (a) transport by crane to a heavy-duty drill press, (b) positioning in the press to align the hole with the drill axis, (c) cleaning out the damaged threads with a greatly oversize drill, (d) transport on two different craneways to the welding department at the other end of the shop, (3) mounting in welding position, and (f) filling the hole with material deposited by welding.

After the part is (g) returned to the machine shop, it is (h) remounted in the drill press (if the press is not tied up with work) or transported to the storage area and then back again when the press is available. Next, part is (i) repositioned and aligned, (j) drilled out to minor diameter of original thread, and (k) tapped with three taps to bring hole to original thread size.

This technique was far from optimum for the following reasons: (1) it required too much handling—four crane lifts on two cranes over several hundred feet, (2) it produced material that was often porous and of low strength, and (3) there was a tendency for parts to warp from excessive applications of heat during welding.

The third technique, the solid-bushing method, while superior to the former two methods, is extremely tedious

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and time-consuming. With this method, after the part is properly positioned in the drill press, the repair operations follow this procedure: (a) the old threads are drilled out with an oversize drill, (b) a fine pipe thread is tapped into the hole, (c) a solid bushing of bar-stock is threaded to mating size, and (d) the bar-stock plug is inserted tightly into the hole.

When properly seated and locked in place, the plug is (e) cut off flush with the top of the boss. Next, the hole is (f) laid out, (g) drilled out with the same size drill that aws used to make the original thread, and (h) tapped with three taps to the originaly size. When the threading operation is finished, the face of the boss is (i) flushed off and the entrance threads cleaned out.

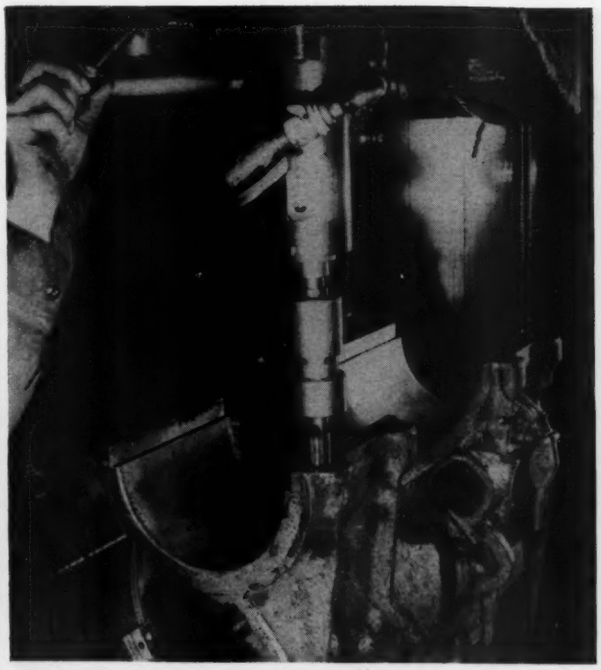
The fourth technique, the wire-insert method, has superceded almost entirely the first three methods and is now used for thread-repair operations. The badly worn 1¼-in. 7-thread hole in the traction-motor base shown in one photograph is to be repaired in this manner. After the base casting is positioned in a heavy-duty universal drill press, the thread-repair operation proceeds as follows:

A drill-guide template is placed over the four axle-cap bolt holes in such a position that the guide bushing is over the damaged thread. The template is fastened to the casting with bolts screwed through guide holes into the three undamaged holes. Next, the worn threads are cleaned out with a 1-19/64-in. drill. The alignment bushing keeps the drill from being drawn off center as it would be if allowed to follow the irregularities of the damaged thread surface.

Thread inserts for through-holes have approximately the same length as the hole depth. To provide unob-

The worn axle-cap thread, foreground, in this multiple-unit motor casting is repaired by the wire-insert method

Damaged threads are cleaned out with a drill slightly larger than the major diameter of the original thread



The hole is prepared to receive the helical-wire thread insert by tapping with special Heli-Coil roughing and finishing tape

Installation of the insert to a depth of one-quarter to one-half a thread pitch below the surface is accomplished with an inserting tool

structed threads, the installing tang on the insert is broken off after insertion. However, in the case of blind-holes, the insert must be slightly longer than the required thread depth since the inserting tang is not removed later and therefore must be below and clear of the bottom of the bolt or stud. In order to insure an ample thread engagement in the given depth of boss, this blind-hole was drilled through, thereby making it a through-hole.

After the hole is cleared of its old threads, special-size standard-pitch threads to accommodate the outside contour of the insert must be provided. This is done by tapping the hole with two special taps labelled "1¼-in-7 Heli-Coil." These taps are keyed to and identified by the original hole size to avoid shop confusion. Instead of the customary three taps, only a roughing and a finishing tap are necessary for this operation.

When the second or finishing tap has been withdrawn and the chips blown clear, a 1¼-in.-7 Heli-Coil thread insert is installed by hand into the hole. The first step in this installation operation is the positioning of the insert on the inserting tool so that the tang fits into the slot of the spindle and that the tang will enter the hole first. When mounted in this manner on the inserting tool, the helical coil is ready to be screwed into the hole. This is accomplished by exerting a slight downward pressure on the tool until the first few threads are engaged. Once engaged, the installation is just a matter of turning the insert into the hole until it is a quarter to a half a thread below the surface of the boss.

Helical-wire thread inserts are made of stainless steel wire having a diamond-shaped cross-section. Each insert is precisely coiled to an outside diameter slightly larger than the major diameter of the tapped hole. As the insert is screwed into the hole, the action of the inserting tool slightly reduces the free outside diameter of the coil. This reduction in diameter brings the outside diameter of the insert to the size of the hole. It also develops internal stresses in the wire that are sufficient permanently to lock the insert in place. After installation, no amount of bolt tightening will rotate the insert. However, it can be removed by hand with another tool.

The next step after insertion is the tank-removal operation, when this is necessary. This is done by giving the tang a sharp blow with a tang break-off tool designed for this purpose. The tangs, which have a vee-shaped notch in them to aid in the removal operation, break off because of the combined bending and shearing action caused by the down-moving break-off tool.

The worn thread, shown in one illustration, had been previously repaired by the build-up by weld method. After a period of severe service, the threads failed again. The failure was attributed to the inherent porosity and relatively low strength, toughness and hardness of the weld-deposited material. Threads tapped into this material are said to have low wear-resistance as well as inferior load-bearing qualities. However, the physical qualities of the 18-8 steel wire used in the manufacture of the inserts is such that permanent threads can be successfully provided in the same welded material that produced the inferior threads.

In addition to the fact that the wire inserts are made from a material having a tensile strength of 180,000 psi, greater load-bearing qualities are achieved because the flexibility of the coil allows the load to be equally distributed over each thread rather than over just a few threads.

Time savings resulting from the use of the wire-insert method are considerable. The threads in the part described were repaired in 15 min. with the wire-insert method as compared with about 1½ hr. for the build-up by weld method, and more than this for the solid-bushing method.

Since with the use of an extraction tool, helical-wire thread inserts can be readily backed out of the holes if this should become necessary, any further thread repair operations on these same holes would require only the removal of worn coil and reinsertion of a new one.

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Six Motor Road Switcher

THE Alco-G.E. 1600 hp. road switcher is now available with six traction motors for heavy duty drag and hump service and in other applications where high tractive force is required, it was announced by American Locomotive and General Electric.

This road switcher is the same basic design as the Alco-G.E. four-motor road switcher, of which more than a million-and-a-quarter horsepower have been delivered to the railroads since 1945.

The two three-motor, three-axle trucks are of the drop-equalizer, modified swivel type. They are designed for ease of maintenance, equal weight distribution and smooth riding at high speeds.

The truck has been designed so that the center motor is fully accessible for all inspection and servicing. Adequate working space within the truck frame at both ends of the center motor is provided.

The truck design is a departure from the usual swivel type. A center plate, offset from exact center, is used as a turning point as in regular practice, but carries only a portion of the load on the truck as the two loading pads support the remainder. This results in equal axle loading despite changes in load. The loading pads are fixed to the locomotive underframe and slide on load carrying plates located on the truck frame. Both center plate and loading pads operate in oil baths.

Arrangement of long equalizers and deep-deflection springs contributes to smooth riding at speeds up to 60 m.p.h. The spring system of the truck consists of four groups of two helical springs each, located near each end pedestal. The truck frame is supported on these springs which in turn are carried on four sets of double, drop-center equalizers extending from the end axles to the center axle. Desired equal axle loadings are attained by proper positioning of springs along the spans of the equalizers and by proper proportioning of the springs. Friction type snubbers are applied in one spring of each group.

The center plate of the truck is located on a cross transom between two motors. The loading-pad bearing surfaces are located similarly on the other transom at the opposite end of the truck. By placing the load carrying members between motors, advantage is taken of the deep transom sections for carrying the load to the side frames. This allows low overall truck height and enables use of the same basic locomotive design as the Alco-G.E. four-motor road switcher.

Standard weight of the six-motor road switcher is 360,-

000 lb., but it can also be supplied with total weights of 270,000, 280,000, 300,000 and 325,000 lb. The locomotive has a continuous tractive capacity of 78,750 pounds at 5.5 m.p.h., using 74:18 traction motor gearing. This compares with the 52,500-lb. tractive force at 8.5 m.p.h. of the Alco-G.E. four-motor road switcher. Tractive force of the new model is equivalent to 21.8 per cent adhesion with maximum locomotive weight of 360,000 lb.

The locomotive has a maximum permissible speed of 60 m.p.h. and may be used in freight or passenger service. For branch line work, where light rail and bridge limitations are encountered, the locomotive can be furnished in lower weight ranges. The first six-motor units were delivered to the Chicago and North Western in April.

Electrical Equipment

The six traction motors are the standard G.E.-752, as used on all Alco-G.E. road locomotives. New insulation and design permit continuous current of 1085 amperes per motor.

Lubrication periods for traction motor armature bearings have been extended to 300,000 miles. Permanently packed high-temperature lubrication of the traction motor armature bearings, adopted as standard almost two years ago, has proved most successful, and is being continued. This lubrication, operated from overhaul to overhaul without greasing service, has not only reduced maintenance but has also increased armature bearing reliability and life. This sealed lubrication is applied to all grease-lubricated electrical rotating equipment of this locomotive.

Progressive overhaul scheduling has extended the maximum life of traction motor armature bearings through three additional overhaul periods to 1,200,000 miles. The motor suspension bearings are equipped with felt-wick lubricators, which provide lubrication equal to expertly packed waste, but require less skill in maintenance.

There are three traction motor connections: (1) series-parallel with three motors in series and full field; and (2) parallel with two motors in series and full field; and (3) parallel with two motors in series and reduced field.

Balanced weight distribution in conjunction with the latest wheel-slip protection combine to assure fullest use of the traction motors' high tractive capacity.

The wheel-slip protective system, operating in connection with the amplidyne excitation system, removes power instantly upon wheel-slip, then reapplies power gradually to prevent recurrence of slip. This gradual reapplication of power is particularly important in the six-motor road switcher, which must operate much of the time at values of adhesion approaching the upper limit, where sudden reapplication of power would in a great number of cases cause wheel-slip recurrence.

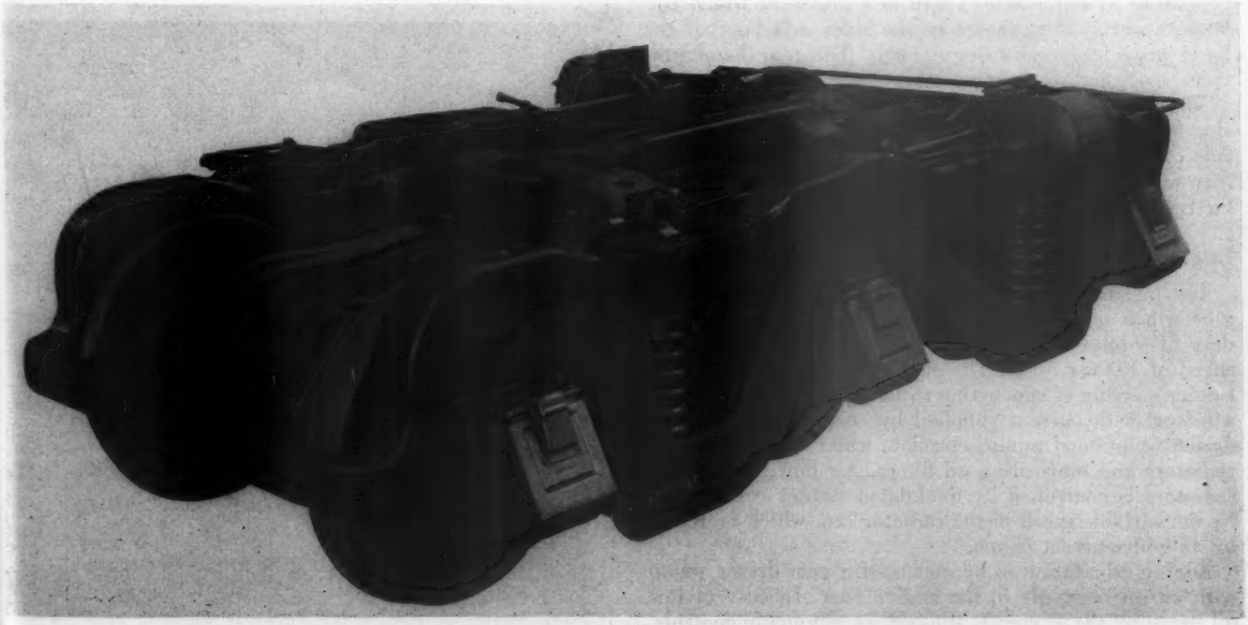
A contactor compartment at rear of front hood contains electrical control equipment.

Contactor compartment apparatus is accessible through doors in the wall of the operating cab and through panels in the partition. Louvres allow for adequate ventilation. Switches and meters are contained in a panel mounted on the compartment wall at the front of the operating cab where they are accessible to the operator in the cab. Dynamic braking equipment, when used, is installed in the rear compartment.

The main generator is a direct current machine containing main and starting windings. The generator is directly mounted on the diesel engine, requiring only one generator armature bearing. Auxiliaries, consisting of one amplidyne exciter, one auxiliary generator and one mechanical traction motor blower, are gear driven from the main generator. The amplidyne exciter is part of the power plant regulation system, and the auxiliary generator supplies power for lighting, battery charging and control circuits. The auxiliary generator operates at constant voltage under control of a regulator. The multi-vance traction motor blower supplies air to the three traction motors on the rear truck. Cooling air for the front truck is supplied by a blower, belt-driven from the engine.

The storage battery is a 32-cell, 426-amp.-hr. lead-acid type. It is installed in two battery boxes, one on either side at the rear of the operator's cab, above the underframe, with 16 cells in each box.

All lights are connected to the storage battery through



The traction-motor truck is of special center plate construction designed to distribute the load

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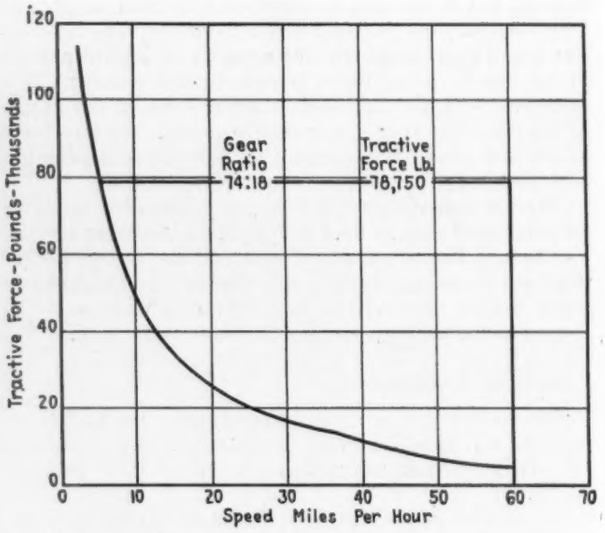
The truck is so designed that center traction-motor and other maintenance work can be performed without its removal from the locomotive



Speed tractive-force curve

circuit breakers and light switches. Operating cab illumination is provided by ceiling and gage panel lights. Lighting is also installed in the front and rear hoods and in the contactor compartment.

There is a headlight of the flush type with a 14-in. glass reflector at each end of the locomotive. Each is fitted with 250-watt, 32-volt lamp with dimming control.

Numeral boxes with electric lighting are applied on each side of the hood at each end of the locomotive.

Underframe and Cab

The underframe is a steel weldment and the superstructure is of welded steel plate. The low front and rear hoods provide all-around visibility for the locomotive crew. The hood in front of the cab covers the engine and other apparatus. The radiators are located in the forward end of that hood. The section of hood over engine and generators is removable. There is a bulkhead which isolates the generator. Doors in the sides and roof of the hood provide access to equipment. The rear hood provides space for steam generating equipment.

The cab is of welded steel with controls on the right side facing the engine hood and a second seat on the left side of the cab. Doors are located in the right side of the rear wall and the left side of the front wall, as well as in the rear cab wall for access to the rear hood.

Engine and Controls

The locomotive is powered by an Alco Model 244 engine which is a vee-type 1,600-hp. unit having 12 cylinders of 9-in. bore and 10-½-in. stroke and a full-load speed of 1,000 r. p. m. The engine is turbosupercharged. Engine starting is effected by using the main generator as a motor, with current supplied by storage battery. Gear driven centrifugal pumps circulate water through engine, radiators and lubricating oil filters. Air flow through the radiators is controlled by modulated shutter control and by the variable speed of the radiator fan, which is driven by an eddy-current clutch.

Engine lubrication is by means of a gear-driven pump with an oil reservoir in the engine base. In case of low oil pressure, the engine is stopped by automatic controls.

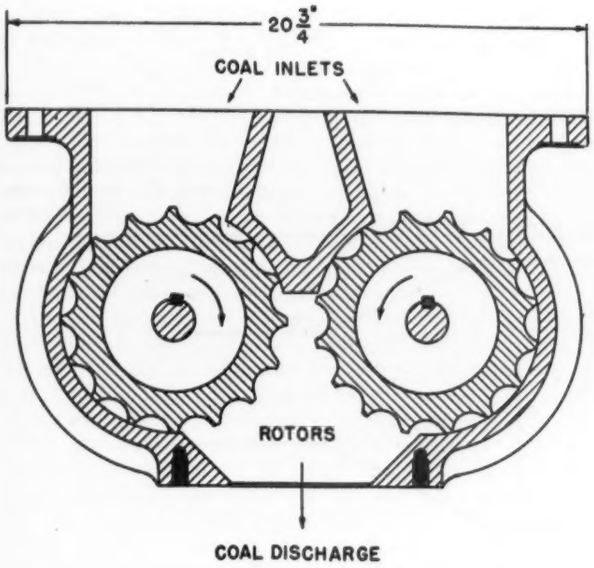
The engine control stand at the left of the operator's seat contains throttle, selector handle, reverser handle, air brake valves, and circuit-breaker type switches for generator field, fuel transfer pump and control circuits, headlight switches, light switches, air-brake gages, speed and transition indicator, load meter, and wheel-slip indicating lamp, as well as signal lights for low oil pressure, high engine water temperature, and ground relays.

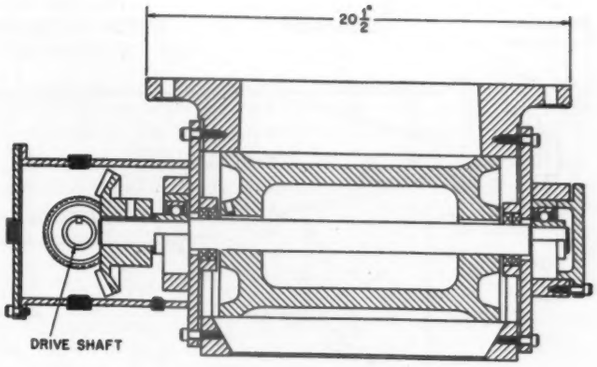
The air brakes are schedule 6-SL. Air is supplied by a two-stage, three-cylinder compressor direct driven by the main engine. The displacement at idling speed (350 r. p. m.) is 78.7 c. f. m. and at full engine speed (1,000 r. p. m.) it is 225 c. f. m. Two main reservoirs below the underframe, have a total capacity of 60,650 cu. in.

Steam generators may be applied with capacity up to 3,500 lb. per hour with a 750-gal. water tank. When the water storage tank is not required a 1,300-gal. fuel oil tank may be used instead as a modification.

* * *

(Atlantic Coast Line, Emerson shops)





Rotolock pulverized coal feeder.

Tests of Coal-Burning Gas Turbine Under Way

Feed controls, combustor and ash-removal system developed on Dunkirk experimental plant under test on locomotive power plant

*By John I. Yellott, Peter R. Broadley and Frederick D. Buckley**

[The paper from which this article is taken is entitled "Progress Report on Coal-Burning Gas Turbine" which was prepared by the authors for presentation on April 6 before the Midwest Power Conference at Chicago. The report is in two parts, the first of which is a final report on 1,000 hr. of operation of the experimental turbine plant using the Houdry-process gas turbine. The second part deals with the test installation of the Allis-Chalmers locomotive turbine, most of which is omitted from this abstract.—Editor.]

THE Locomotive Development Committee of Bituminous Coal Research, Inc., has now operated a full-scale Houdry process gas turbine with coal as its primary fuel for 1,000 hr. As a result of this experience combustion and ash-removal equipment has been constructed with which a 4,200-hp. Allis-Chalmers locomotive-type turbine will soon be in operation on a stationary test bed at Dunkirk, N. Y.

Operation of the Houdry turbine on a direct-fired open cycle has demonstrated the feasibility of feeding pulverized coal into a combustion chamber which runs at 45 to 60 p.s.i.a. Equipment for continous removal and discharge of the resulting ash has been developed. Blade erosion has been largely confined to the stationary blades of the experimental turbine and to regions of the turbine where the unremoved ash was apparently concentrated by centrifugal forces in the inlet piping. Extent of erosion depends upon dust concentration and upon particle size. There are strong indications that —10-micron particles are relatively harmless. Particles larger than 25 microns (.001 in.) in diameter are capable of causing severe erosion and must be removed in order to prevent damage to turbine cylinder blades.

Combustion System

A number of burners and combustors have been tested. The best combination is shown in two illustrations. The combustion chamber is essentially a film-cooled stainless-steel enlargement of a jet-engine combustor. The coal is carried into the system by primary air at a ratio of 1 lb. of coal per pound of air. Air-coal velocity

*Mr. Yellott is director of research, and Mr. Broadley, assistant director of research, Locomotive Development Committee, and Mr. Buckley, manager, Research and Development division, L.D.C. Project, American Locomotive Company.

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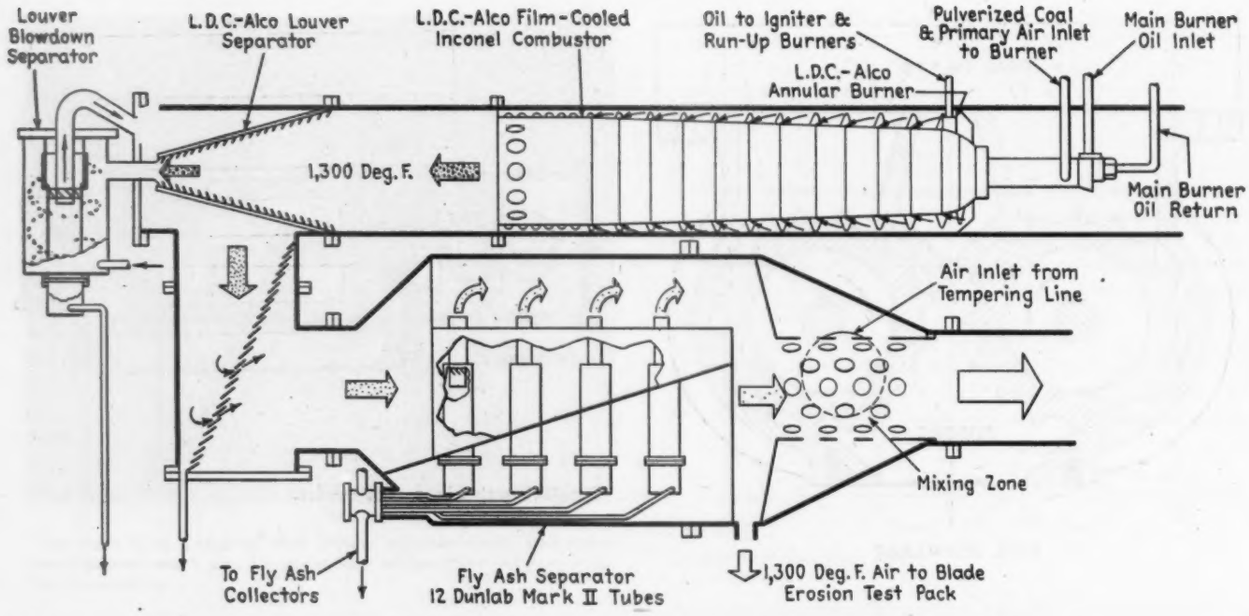
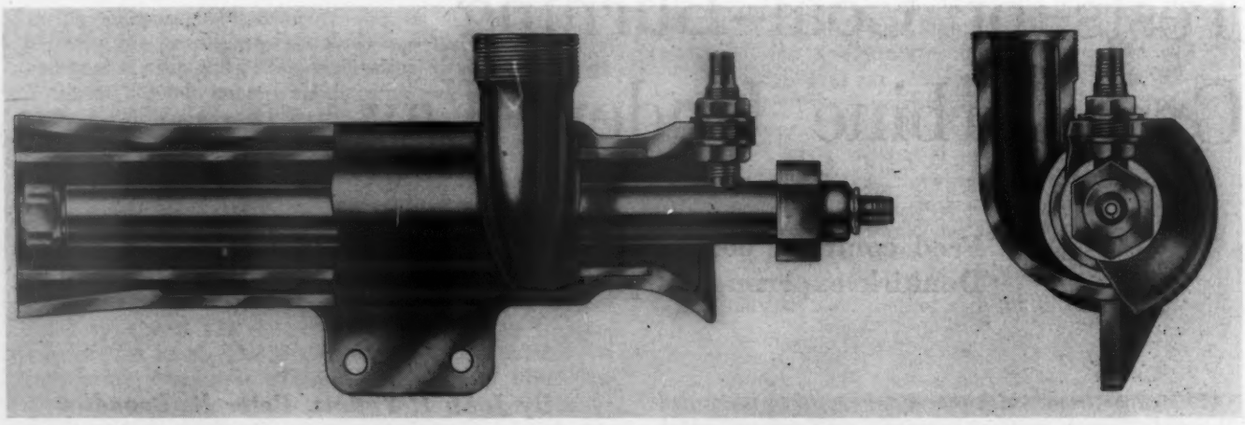
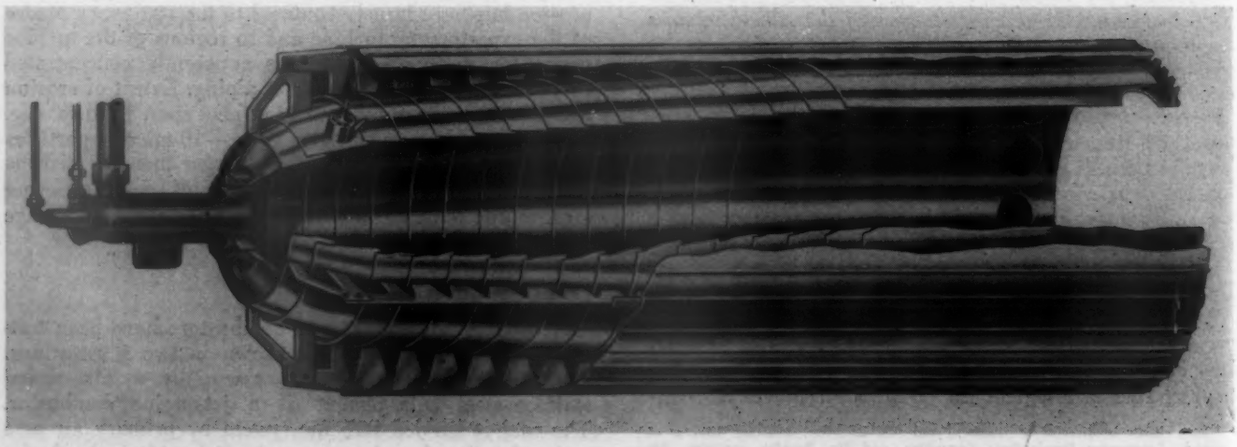

Louver Blowdown Separator
L.D.C.-Alco Louver Separator
L.D.C.-Alco Film-Cooled Inconel Combustor
Oil to Igniter & Run-Up Burners
Pulverized Coal & Primary Air Inlet to Burner
Main Burner Oil Inlet
L.D.C.-Alco Annular Burner
1,300 Deg. F.
Main Burner Oil Return
Air Inlet from Tempering Line
Mixing Zone
To Fly Ash Collectors
Fly Ash Separator 12 Dunlab Mark II Tubes
1,300 Deg. F. Air to Blade Erosion Test Pack

Arrangement of the combustion and ash-removal equipment for the experimental gas turbine at Dunkirk



The Dunkirk annular burner for pulverized coal and oil. Connections, from left to right, are coal and air inlet, oil inlet and oil return. The annular passage is for the coal-air stream. The Peabody oil burner tip is in the center of the secondary air passage



The L.D.C. film-cooled combustor

is kept above 50 ft. per sec. to eliminate any possibility of flashback through the burner.

The L.D.C. annular burner, shown, developed at Dunkirk, provides a central location for a Peabody wide-range oil burner which is cooled by secondary air entering the combustor. The coal-air stream swirls out of the burner with clockwise rotation imparted by the tangential inlet. The secondary air entering around the burner is given a counterclockwise spin by vanes. The resulting turbulence causes the flame to be quite short and intense, while additional air enters through slots to keep the combustor head relatively clean and cool.

An oil-fired ignitor is located in the combustor head. This ignitor, also a Dunkirk development, uses a small stream of "ram" air to bend a hot spark into the oil spray, thus keeping the spark plug clean and cool. A flame-on indicator is being developed to replace the sight glasses which are now in use to enable the operator to know when the combustor is lit off. This indicator uses two chromel-alumel junctions, one of which is exposed to the ram air and shielded from the flame, while the other "sees" the flame directly. The small e.m.f. generated by the thermocouple is fed to a magnetic amplifier which boosts the current up to the point where a relay can be operated.

The principal problem in combustor design is to devise a method of support which will keep the film-cooling slots open after the metal becomes hot. The rings must be allowed to expand radially, but must be restrained axially. The strong-back arrangement in the combustor evolved from ideas tried at Battelle Memorial Institute and at Fontana, Calif. This design was given more than 250 hr. of satisfactory service and will be used in the locomotive turbine. A new design, affording more radial flexibility, is currently being tested in the Houdry unit.

Combustion efficiency with the L.D.C. film-cooled combustor is affected primarily by coal fineness and air-coal ratio. All tests up to the present time have been run with a high-volatile Pittsburgh No. 8 bituminous coal. It has been felt that enough variables were present without introducing the additional problems presented by different types of coal.

If coal fineness is held constant at about 97 per cent —100 mesh, 90 per cent —200 mesh, the combustion efficiencies shown in Table I may be expected for high-volatile bituminous coal.

The Canadian Bureau of Mines has conducted a series of tests on coals of various ranks, using a film-cooled combustor similar to that referred to here. They have found that combustion efficiency varies directly with volatile content. It is probable that low-volatile coals will require a hot-wall (ceramic) combustor for acceptable efficiency. Coals of the lowest rank, such as lignite, should give even higher efficiencies than those listed in Table I.

From a mechanical point of view, the combustor is surroudnded by a radiation shield which is made of 1/16-in. Type 347 stainless steel. The combustor is secured to the pressure shell at the burner end and is free to expand axially.

At the present stage of deveopment, the igniter remains in use while coal is being burned. It is felt that the expenditure of about 8 gal. of diesel fuel per hour is a good insurance premium against loss of flame due to a momentary interruption of the coal supply. Without the ignitor, the coal flame alone can be maintained over a turn-down ratio of at least four to one, but the subject of range has not yet been completely investigated. Since there is no ceramic material in the combustor and the metal cools almost instantly when the flame is extinguished, there is no source of reignition other than the ignitor in case of fuel failure.

TABLE I—COMBUSTION EFFICIENCY vs. TEMPERATURE RISE

Temperature rise, deg. F.	300	400	500	600	700
Combustion efficiency, per cent	81	83	86	93	95

Ash Removal

The development of the direct-fired, coal-burning gas turbine has presented many difficulties, but by far the most fundamental and vital problem is ash removal. Various solutions and compromises may be found to all other problems, but ash removal must approach perfection if the turbine is to have an acceptable life. The question of ash removal is very severely complicated by the tremendous range of ash particle size. Ash fragments have ranged from dislodged deposits 12 in. long to submicroscopic particles. Equipment which separates particles in the 20-micron size range is subject to clogging when confronted with 1-in. slugs.

Louver Separator

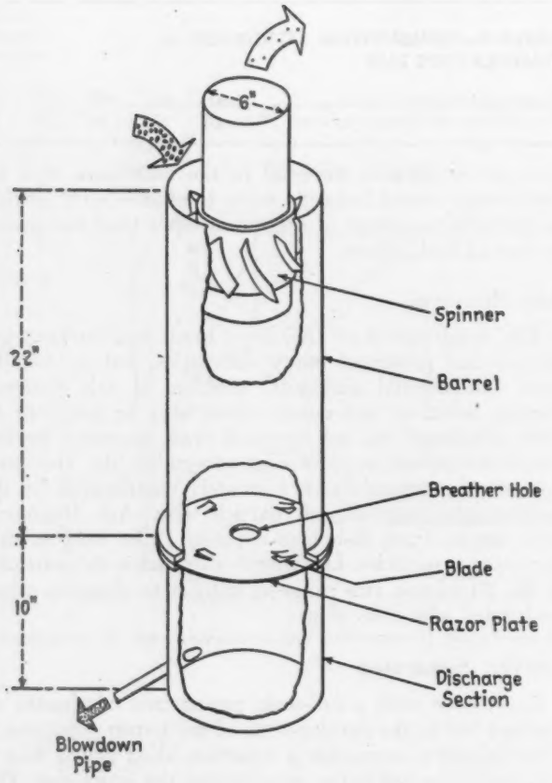
Experience with a full-scale pressurized combustor at Fontana led to the development of the louver separator.* This separator resembles a venetian blind rolled into a cone, with the ash-laden air entering the large end. The air and the finer ash particles can make the abrupt change in direction required to find their way out of the louver, but the larger ash particles and about four per cent of the air pass out through the louver blowdown line.

The louver also serves very effectively to eliminate temperature stratification and to produce a flat temperature profile at the inlet of the main ash separator. The annular burner gives a "hot core" to the air leaving the combustor, and the particles in this core apparently resemble minute eggs in that they are "frozen" on the surface but sticky inside. When these particles impinge on a surface such as the louver elements, they tend to stick. Building up of ash deposits on the louver is the present limiting factor in the operation of the Houdry plant. After 35 to 40 hr. of operation at a fixed firing rate, the louver area becomes restricted to the point where the pressure drop is excessive. When the unit is shut down, the louver cools off quickly and the metal rings shrink much more vigorously than do the ash deposits. Most of the ash cracks off and the remainder is easily removed by hand.

Blowdown Separator

The louver blowndown air must be returned to the separator inlet, because the system cannot tolerate an air loss of anything like four per cent. For this purpose, a blowdown separator has been developed which concentrates the ash into a very small stream of air and returns most of the blowndown flow to the down-stream side of the louver. This separator consists of a 10-in. Dunlab tube mounted within a 20-in. diameter cylinder. The louver blowdown line enters the outer cylinder radially and is given a tangential "kick" by a deflector plate. The air revolves around the inner tube and carries the finer particles through a ¼-in. screen into the Dunlab tube. This tube separates the ash from the air and blows the

* See the May, 1950, *Railway Mechanical and Electrical Engineer*, page 245.



Dunlab Mark II ES2 ash separator

ash out in a 15 cu. ft. per min. stream from the discharge pot. The cleaned air spins back up through the tube and re-enters the main air stream.

The larger ash particles, unable to pass through the screen, drop to the bottom of the outer cylinder where they encounter a tangential jet of cold air. This jet acts by attrition to grind up the larger particles and to carry the resulting finer fragments up through the screen. The cold jet also quenches the burning ash and prevents any serious sintering of the particles which collect in the cylinder. The combination of louver and blowdown separator disposes of the larger pieces of ash. The air stream required to carry the ash away is less than 1/10 per cent of the flow to the louver.

Fly-Ash Separation

Separation of the fine ash particles is an extremely difficult problem. Early attempts to use small diameter cyclone separators for this purpose were defeated because of the combustible nature of the ash. It was learned that a continuous ash discharge was essential with a film-cooled combustor because of the high-carbon content of the ash. For a high-volatile coal a combustion efficiency as high as 95 per cent still leaves about 35 per cent carbon in the ash, which must be cooled below 600 deg. F. before it will cease to burn.

Development of the Dunlab Tube

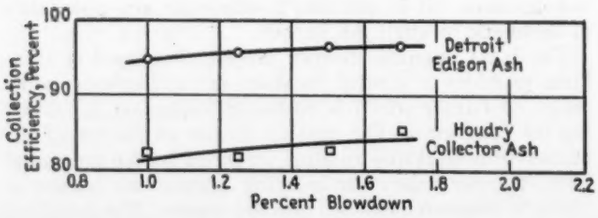
Midway through 1950 it became apparent to the writers and the L.D.C. Steering Committee* that highly efficient ash separation was the paramount requirement in a direct-fired coal-burning gas turbine. Consequently, a separator test stand was erected at the Dunkirk laboratory. Compressed air from the shop line is admitted through a critical flow nozzle which serves the dual purpose of flow measurement and aspiration of the test dust. The dust is fed in measured amounts by a Syntron vibrating feeder salvaged from an earlier L.D.C. project. A gas-fired combustor is used to heat the air to any desired temperature up to 1,400 deg. F.

The objectives of the separator test-stand program were to learn what collection efficiency could be obtained from commercially available tubes operated at high temperature and high air flow and to develop a simple but reliable method of continuous ash discharge. It was also hoped that improvements could be made in separator performance which would reduce the turbine inlet dust loading and positively prevent any plus 20 micron ash from passing through the turbine.

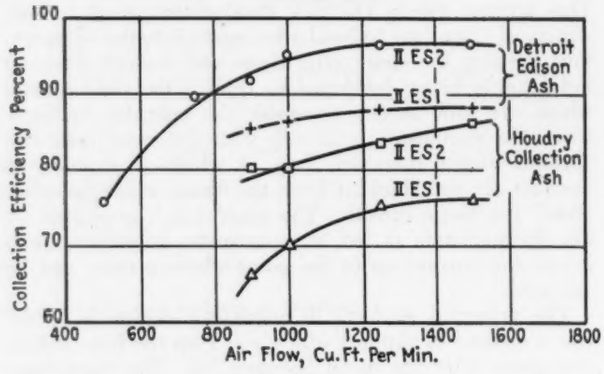
Several types of ash were used. Many of the tests have been run with a Detroit Edison Company fly ash which is available in unlimited quantities and is consistent in its particle size distribution. A number of tests have been run with ash caught by the separator during operation of the Houdry unit. Typical analyses, made with the Roller elutriator, are listed in Table II.

The Dunlab tube, illustrated here, has been investigated in a series of tests in which the tube dimensions were

* K. A. Browne, Chesapeake & Ohio; F. H. Einwaechter, Baltimore & Ohio; C. R. Mabley, Jr., Island Creek Coal Company; E. C. Payne, Pittsburgh Consolidation Coal Company, and C. K. Steins, Pennsylvania.



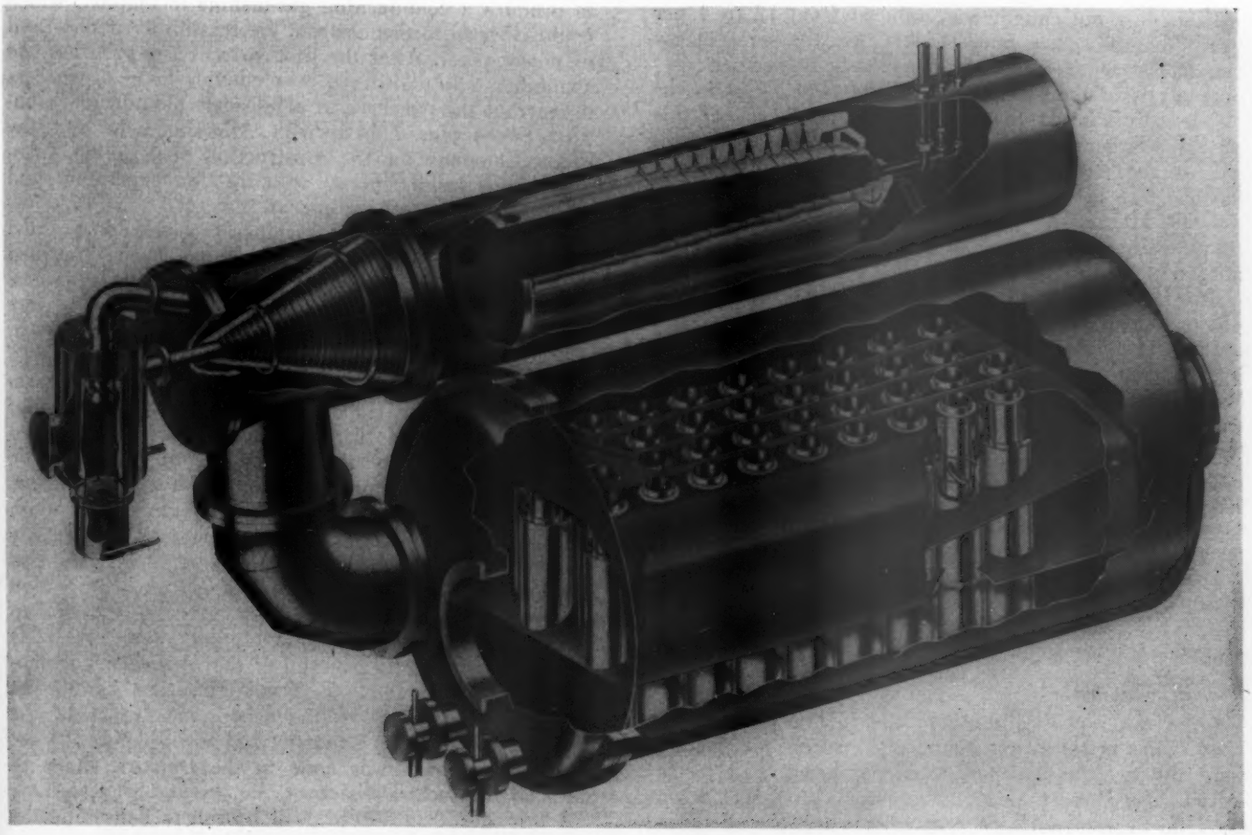
Collection efficiency of the Dunlab Mark II ES2 sparator in relation to blowdown at 1,300 deg. F. and volume of 1,500 cu. ft. per min.



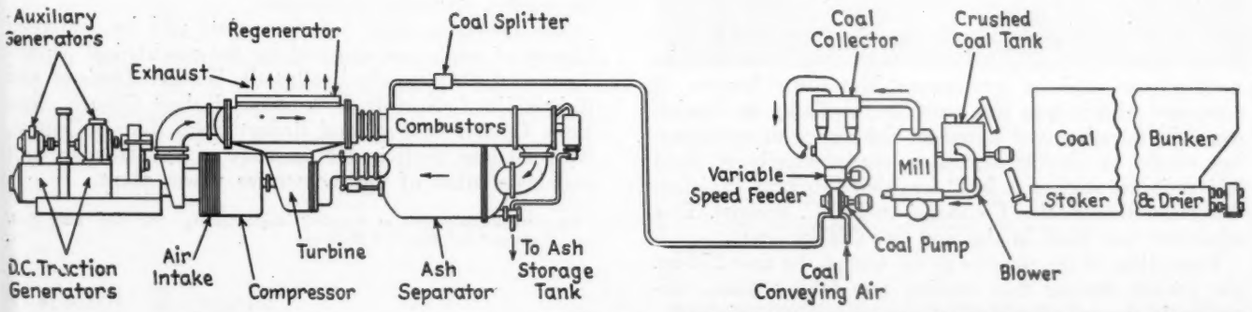
Collection efficiency of the Dunlab Mark II ES1 and Mark II ES2 in relation to air flow at 1,300 deg. F. and 1½ per cent blowdown

TABLE II—SUBSIEVE SIZE ANALYSES OF FLY ASH

Micron Size	Houdry	Detroit-Edison
−10	49.34	20.4
+10-20	30.0	22.9
+20-40	16.3	25.9
+40-80	4.0	22.0
+80	0.36	8.8



The combustion and ash-removal system for the locomotive gas-turbine power plant



Arrangement of coal-handling, combustion and ash-removal equipment for the tests of the Allis-Chalmers locomotive gas turbine at Dunkirk

systematically varied. This tube was evolved after a study of the German literature disclosed that excellent results had been reported by Feifel for cylindrical tubes equipped with iris diaphragm separator plates. The development shown differs from previously disclosed ideas in that it uses blades in the "razor plate" to insure positive and vigorous rotation of the dust-laden air which enters the lower discharge section. A tangential blowdown pipe provides continuous ash discharge.

After preliminary studies had shown that the Dunlab tube had excellent possibilities, tests were carried out to determine the optimum dimensions. Starting with a 10-in. Type VSX Western Precipitation Multiclone, it was found that good results were obtained with the dimensions shown in the drawing on page 52.

Graphs on page 52 show typical test data for both types of dust listed in Table II. It is apparent that collection efficiency increases with air flow up to 1,500 cu. ft. per min. per tube, but the increase is small above 1,200 cu. ft. per min. Efficiency also depends upon the amount of air blown down through the discharge tube. Fortunately, the curve of efficiency vs. per cent blowndown is quite flat above 1 per cent. At 1,500 cu. ft. per min. per tube a blowdown of 15 to 20 cu. ft. per min. is adequate. A velocity of 60 to 80 ft. per sec. is maintained in the blowdown pipe, which is more than enough to convey the separated dust.

After the optimum tube dimensions were determined, the Multiclone spinner was altered by extending the vanes to reduce the exist angle from 45 deg. to 30 deg. This increased the pressure drop by about 30 per cent, but it also raised the efficiency at 1,500 cu. ft. per min. by 8 to 11 percentage points. It is more significant to express the gain by stating that the amount of Detroit

Edison dust *not* caught was reduced from 12 to 4 per cent. With the much finer Houdry ash, the per cent *not* caught was reduced from 25 per cent to 14 per cent.

Analysis of the particle size of the "loss" dust in the cleaned air showed that less than 10 per cent of this dust was larger than 10 microns and only 1 to 2 per cent was larger than 20 microns. Exact determination of particle size in the subsieve range is both tedious and difficult. Microscopic analysis of the plus 20 micron size fraction showed few, if any, particles larger than 30 microns.

The Houdry separator was again modified after 33 hr. of the fourth 250-hr. program had been run. The cones at the bottom of the Multiclones were cut off and replaced by the Dunlab arrangement of "razor plate" and discharge section. Individual blowdown lines were retained with manometers to indicate that each tube was discharging properly.

As this report is being completed, the Houdry unit is again in operation. Dust collection efficiency with the combined louver and Dunlab separator appears to be near 90 per cent, with only about 10 per cent plus-10-micron dust in the turbine inlet air. The dust loading at the turbine inlet is about 15 lb. per hr. in an air flow of 170,000 lb. per hr. (735 deg. F., 30 p.s.i.g.), giving a grain loading of 0.063 grains per cu. ft.

Blade Erosion

From the very beginning of the L.D.C. program in 1945 it has been realized that blade erosion and fouling were the two fundamental problems which had to be solved. The Houdry turbine, borrowed by L.D.C. from the U.S. Bureau of Mines, was used to test the effectiveness of several separators. Four 250-hr. tests have been completed.

The first problem in ash removal was to find a type of separator which would not be burned up by ash containing 35 to 50 per cent carbon. The American Blower Corporation's Type ST-361 was tried first, because of its compactness and its continuous blowdown feature. A separator of this type was built for L.D.C. by the Turbodyne Corporation and tested at Fontana with encouraging results. A similar separator, made entirely of Type 347 stainless steel, was built by Alco Products Division, American Locomotive Company, to L.D.C. designs. This separator was used in the first two 250-hr. tests.

Inspection of the turbine at the end of the first 250-hr. test period showed that erosion was taking place, primarily in the cylinder blading.

After the first 500 hr. of operation the first two cylinder rows and the first rotor row were replaced. The separator was also changed. An 18-tube Multiclone battery was installed with troughs and screws for ash removal. This separator was not satisfactory because of recirculation in the troughs, and very rapid erosion took place. Erosion was still limited primarily to the cylinder blades, although there was some thinning and sharpening of the tips of the rotor blades.

Rotor blading was relatively undamaged in the third 250-hr. test. Few, if any, new nicks were observed in the leading edge of the first row, indicating that the new separator was effectively preventing "rocks" from entering the turbine. The first three cylinder blade rows were again renewed to eliminate any chance of blade breakage and to give a sound basis for comparison of results with the improved separator in the fourth 250-hr. test.

The L.D.C. Locomotive

The objective of the L.D.C. program has always been to produce a coal-burning gas-turbine locomotive which could be used to demonstrate the feasibility of this kind of power plant. After the first year of the program the committee felt that there was enough hope of success to warrant the purchase of a full-scale gas turbine. Contracts were placed both with Allis-Chalmers and the Elliott Company for the construction of 3,750-hp. locomotive-type turbine plants with traction generators and all necessary control equipment.

Construction of the two turbines proceeded in parallel with the development work which has been described in this paper and in previous Midwest Power Conference presentations. * Delays in the research program were closely paralleled by delays and unexpected problems in the designing and building of the two power plants.

In the fall of 1950 enough experience had been accumulated with the Houdry turbine to justify the belief that the locomotive turbines could safely be operated on pulverized coal. Acting as always on the optimistic assumption that the problems would be solved as they arose, full-capacity coal-handling equipment had been ordered from the Read Standard Corporation (formerly the Standard Stoker Company) and a pulverizer had been purchased from the Babcock & Wilcox Co. Erection of a test plant was undertaken, under the supervision of E. L. Cofrances, in a suitable building made available by the Alco Products Division of the American Locomotive Company at Dunkirk. The engineering of the test plant was carried out at the Schenectady office of the American Locomotive Company and construction of most of the components was done in the Dunkirk shops of the Alco Products Division.

A test of 250 to 500 hr. will be run to determine the effect of 1,300 deg. F. air containing —10-micron ash upon the Allis-Chamers turbine. If the results are satisfactory, a series of tests will be run simulating actual locomotive operating conditions.

The operating crew for these tests will be composed largely of engineers assigned by the mechanical department of L.D.C. member railroads. Warner Jamison and Robert Hord, Norfolk & Western; Robert Crouch, New York Central System, and Robert Fort, Illinois Central, have already participated in tests of the Houdry unit and installation of the locomotive power plant.

* See "The Gas-Turbine at Dunkirk," beginning page 245, May, 1950, *Railway Mechanical and Electrical Engineer.*

Holds Pistons for Cleaning or Machining

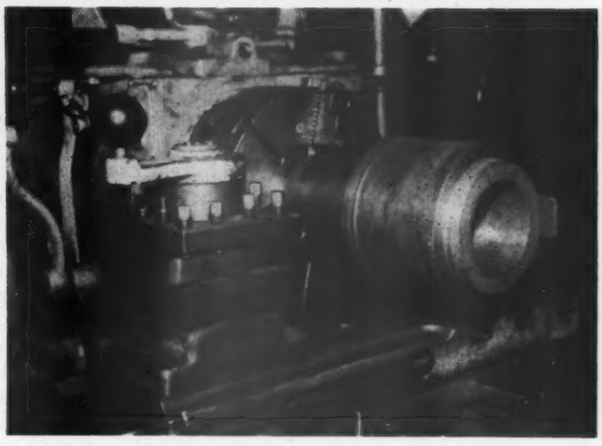
A piston arbor built at the Kinzie street shops of the Chicago & North Western holds and aligns pistons for turning the ring grooves oversize and for cleaning the piston and grooves. The end of the arbor fits into the top of the crown where the piston carrier normally goes. A shoulder on the drive end of the arbor fits the lower section of the carrier. A small ear welded on one side drives the assembly through the ribs in piston top.

The arbor is mounted permanently on a bench for the cleaning operation, and is driven by an air motor. Emery cloth or a wire brush is used to clean the exterior surface of the piston, and a section of a ring to clean the ring grooves.

The arbor for turning the ring grooves oversize is identical with the one for cleaning the pistons with two

Arbor to hold pistons for cleaning or for turning ring grooves oversize. In the arrangement for the cleaning operation shown above, the arbor is permanently mounted and driven by an air motor

The arbor with the piston in place showing how the piston fits the arbor



The arbor in place in the turret lathe for turning worn ring grooves oversize. The shank extends through the headstock and aligns the piston as the shank is inserted in place. The drive is by the small ear on the far side of the arbor

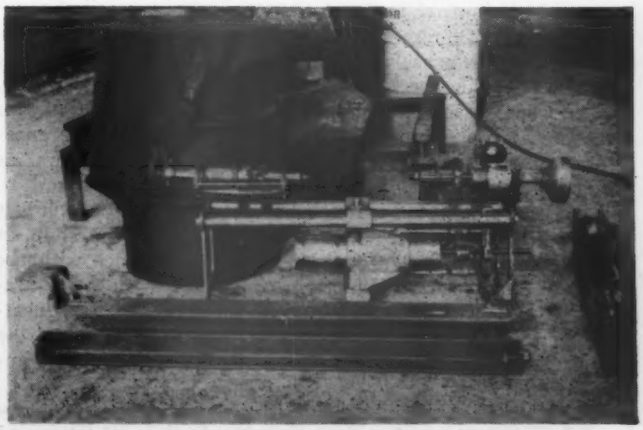
exceptions. The arbor for turning is portable and is placed in a turret lathe only as needed. This arbor also has a shank which fits clear back through the headstock of the machine. With this arrangement, the piston is aligned automatically as the arbor shank is inserted in the lathe; setup time is a matter of a minute or so. The portion of the shank near the piston-holding end is larger in diameter than the rest of the shank, and this portion is clamped by the chuck jaws for rigidity while turning the grooves.

Diesel Wheels Reflanged in Place

Wheels with the flange too high but otherwise OK can be restored to permissible contour in 3 to 4 hours without removal from the locomotive by an arrangement built by the Belt Railway of Chicago.

The first step is to fasten the rollers shown at the right in the illustration to the rails of the pit. The roller stands on the opposite sides of the pit are connected and secured to each other by the angle iron in the foreground. The brace, shown immediately behind the angle iron, rests on the rails and is secured in place by the two set screws on each end. This brace supports a pair of crank pin grinders used to cut the scale before machining.

The high flange is cut down by a form tool which is supported in a holder bolted to the roller stand. Feed is by hand screw. During the turning operation the wheels are revolved by the traction motor, the power being supplied by an electric welding machine.



With this arrangement wheels do not have to be removed from diesel locomotives to correct high flanges. On the right is one of the two roller stands which support the pair of wheels to be re-flanged and which holds the form tool. The crank pin grinders remove the scale

Hot Boxes— Causes and Remedies*

By Arthur H. Keys†

THE latest available data compiled by the Mechanical Division of the Association of American Railroads reveals that an average of 17,500 freight cars were set off each month between division terminals on all roads during the last five months of 1950, and while a month to month improvement is indicated, as warm weather subsides and we go into the fall and winter months, this improvement is termed seasonal.

It is interesting to note that the larger percentage of cars set off between division terminals are foreign cars—cars not owned by the handling road. For the last six months of 1950, foreign cars represented 77 per cent of the total cars set off. This would indicate that system cars are being given more attention than are foreign cars.

This is no doubt due to the failure of the receiving roads to allot sufficient time to the box packers or interchange inspectors to go over the boxes, examine them and set up the packing before dispatching the cars in freight trains.

The Baltimore and Ohio Railroad, since 1942, has greatly reduced the number of freight cars set off between division terminals account of hot boxes. For the year 1942, 5,520 freight cars were set off due to hot boxes, 3,232 of which were foreign cars and 2,288 were system cars. The average mileage per car set off was 276,511 miles. During the year 1950, a total of 2,222 cars were set off, 1,697 of which were foreign cars and 525 of them system cars, and the average mileage increased to 558,769.

There were many factors contributing to this improvement. Some was due to better truck maintenance on system cars; better attention given to cars received in interchange before allowing them to depart over the initial division, and by giving journal boxes attention at intermediate terminals.

We have made no radical change in our materials, such as journal bearings, cotton packing or oil, but we did improve our shop practices giving closer attention first at the wheel shop where wheels are mounted, or where treads are turned, or the journals are trued. This, in some cases, required repairs or replacement of our wheel shop equipment to bring it within the tolerances specified in the A.A.R. Wheel Shop Manual. Renewal or repairing journal bearing wedges that were found to be flat or distorted was another important step which was found essential in starting the car out of the shop in proper condition for service. Strict compliance with the A.A.R. Standard Practices in connection with the saturation and preparation of journal packing, and by educating the men selected to repack journal boxes as to the proper method of doing their work is essentially important.

While cars are in the shop for heavy repairs, all parts of the truck are dissected and the dust guards renewed regardless of their condition. The renewal of dust guards in itself insures that the truck is completely dismantled and this insurance is quite economical, even though a good dust guard is occasionally found.

At interchange points inspectors must inspect the journal boxes immediately on receipt of the cars from connections. Many boxes, which are running above normal temperature, can be detected at this time and the bearings removed. And, in many cases, the cause of heating will be found to be waste grab. This condition cannot ordinarily be detected after the box has cooled down. Each of these cases is a potential hot box and may require setting the car off on the line of road.

Instructions in the Wheel and Axle Manual effective February, 1951, contain many new recommended practices which *should* be followed and many mandatory rules which *must* be followed. An additional requirement has been added in Section 20—Mandatory Rules covering wheel shop practice relating to the use of magnetic particle testing of axles. Under Paragraph 355, Section 20, covering Axle Lathe Practice, Section 0 requires that in addition to Magnafluxing all journal surfaces having any discoloration due to overheating, or if any circumferential checks or cracks are found, which cannot be turned out without going below the condemning limits, all mounted wheels removed from cars must be magnetic particle tested before being returned to service.

This is an excellent rule and one, if complied with, will reduce the large number of broken or burned off journals which are occurring due to fractures and copper penetration at the time of previous heating. Occasionally a journal will break off without showing any discoloration or without heating. In the majority of cases copper penetration up to an inch or more will be found in the broken part. The test laboratory has no difficulty in determining, beyond any question of doubt, that the journal failed due to a crack which had its inception at the time of previous heating and which apparently was not detected at the wheel shop before the wheel was returned to service. There are a large number of failed journals that break off showing a straight break with copper penetration, even though they show to have been heated to some extent at the time of accident but not sufficiently heated, in the opinion of the wreck master, car department and operating officers, to term them burned off journals. In many cases there is no taper of the end which broke off, although the stub is badly distorted from contact with the journal box. When such journals are analyzed by the test department the cause is usually attributed to overheating, although the test department cannot definitely say that the fracture and the copper penetration did not take place during the previous hot box.

I have purposely elaborated on this subject as it is important to comply with the instructions contained in

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* A paper presented before the Eastern Car Foremen's Association, New York, April 13, 1951

† Superintendent Car Department, Baltimore & Ohio

Paragraph 355 of the Wheel and Axle Manual relating to the magnetic particle testing of all journals at the Wheel Shops. If only a single fractured journal is detected by the Magnafluxing method it may prevent a costly accident and serious disruption of railroad traffic.

Sufficient qualified employees should be available at intermediate terminals, where engine and train crews are changed, fill-outs made, and where a terminal air brake test must be made before the train again departs. It is important that this intermediate attention be given and, while the terminal operating officers will be reluctant to hold the train a few minutes longer to enable the car department to perform this work, we have convinced our operating department it is much more economical to hold a train in a terminal a few more minutes than to delay it on the line of road setting off cars. We attribute much of our hot box improvement to the cooperation we are receiving from our operating department.

Passenger Cars

Hot journals on passenger cars are more annoying than on freight cars. When it is necessary to set a car out of a train, the passengers must be transferred to other equipment, including those who might be asleep. There is also a possibility of a burned off journal if it is not discovered by crew or some other employee.

The same precautions as recommended on freight cars are applicable to passenger cars. Boxes must be repacked periodically, after a careful examination is made of the bearings, wedges and dust guards. A thorough repair job must be made when a car receives classified repairs or when it is in the terminal for servicing. At intermediate points, where time permits, the box lids should be raised and packing adjusted when necessary. Where time does not permit raising the lids an inspector should feel each box with his bare hand and any box found running above normal temperature should be further inspected to determine the cause.

In 1942, we obtained a mileage of 497,054 miles per hot box on passenger cars. This included system and foreign cars. In 1950, a mileage of 4,236,370 miles per hot box was obtained.

While some of the improvement made can be attributed to the use of roller bearings on passenger cars, it is just as important, if not more so, to know that roller bearing boxes are maintained to the highest degree of perfection and that they have sufficient lubrication in them to function properly. When a roller bearing box starts to heat, we find ourselves in a rather helpless position. Nothing can be done except to set the car out of the train, remove the wheels and boxes and forward them to the shop for further examination.

We recently had two roller bearing failures that were caused by a kinked cover gasket, a kink only large enough to permit a drop of oil at a time to leak out of the box and be blown away; yet when the boxes burned up it was due to the loss of all of the oil. It is important that the cover gasket be uniformly applied under the lid. Cap screws are generally used in roller bearing boxes which makes it impossible to center the gasket on the box before applying the cover, and carelessness on the part of the employee applying the cap screws often results in the gasket failing to properly seal. To overcome this, four dummy studs are provided at our shops and terminals, which insures the gasket being properly applied. After the cap screws are located in the other bolt holes and dummy studs are removed and the remaining cap screws applied. This has greatly improved our gasket leakage.

Another roller bearing failure occurred because one of our wheel shops, after making a thorough examination of the bearing, at wheel change, failed to refill the box with grease; the terminal, assuming that the wheel shop had done the work, allowed the car to go forward. The result was overheated bearings.

We cannot reduce hot boxes by looking over the monthly reports issued by the Mechanical Division showing the mileage made per hot box set off and feel satisfied that the mileage on our own railroad is greater than on a neighboring road. We must do something about it and convince ourselves that we are doing everything that can be done to lick the problem—first by doing a first class job when a car is in the shop; second, by giving journal boxes attention before starting the car out on its run; third, by setting up the packing at intermediate points where the train stops to change crews.

Engineers have attempted, for many years, to develop devices to prevent or reduce hot boxes. There are a number of excellent devices, some of which have been approved, that have been helpful in preventing hot boxes. For several years we experimented with packing retainer springs in our passenger cars. These were designed to hold the packing in place, to keep it from turning up against the journal bearing and allowing waste to enter between the journal and the bearing, causing waste grabs. Their use was so successful on our passenger cars that they have been adopted for use on our freight cars.

However, this is not a cure-all. You cannot simply place a packing retainer spring in a journal box and forget about it. It must be removed periodically, the packing set up and the spring replaced.

For many years a rubber pack has been under test which fits in the bottom of the journal box. It is filled with oil saturated waste. This pack hugs the side of the journal in such a way as to prevent the waste getting up under the bearing. While this pack is still in the test stage, the results obtained have been gratifying, and we will no doubt hear more about it in the months to come.

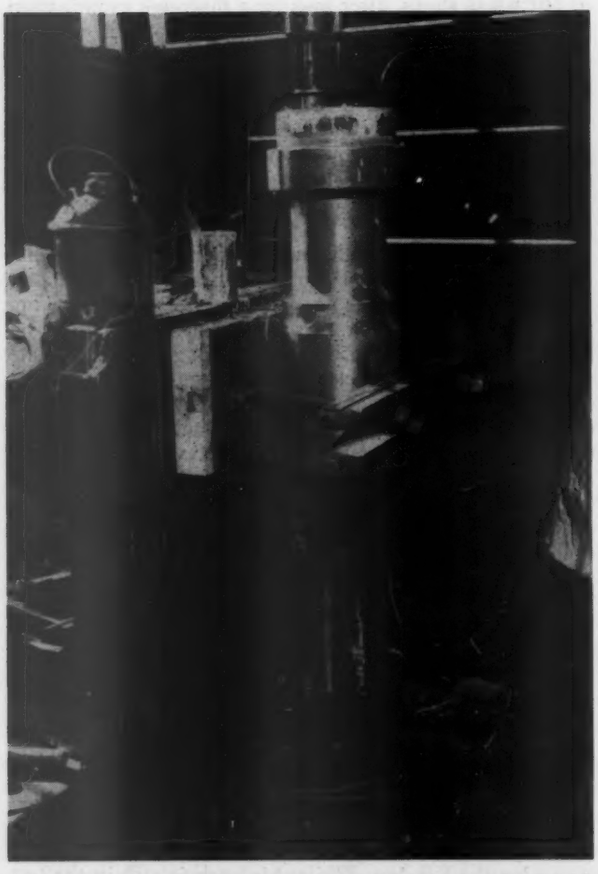
The substitution of felt pads for cotton or wool waste has been tried and found to have considerable merit. We have a number of passenger cars equipped with such a device, which is giving excellent service. One of the passenger cars has been in daily service between Jersey City and Chicago for the past 30 days, and the results obtained have so far been satisfactory.

The action of the A.A.R. Committee on Lubrication of Cars and Locomotives in modifying A.A.R. Interchange Rule No. 66 to provide more frequent time periods for periodical attention to journal boxes so as to improve the lubrication performance of cars was, in our opinion, an excellent decision and will go far in reducing heated journals.

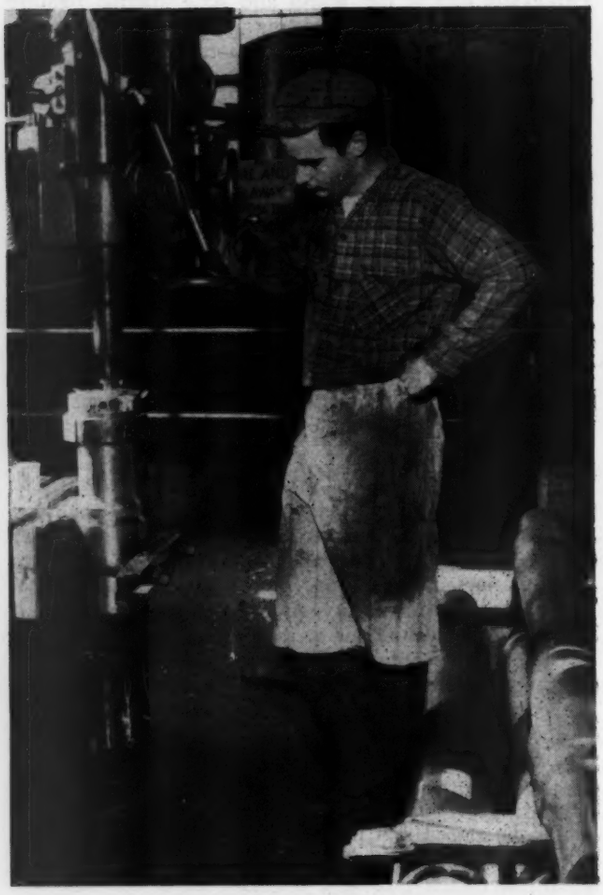
Holding Fixture Minimizes Set-Up Time

A radial drill press has been adapted, by means of an auxiliary holding fixture, to a variety of jobs ranging from drilling the end of axles to refacing Vapor steam-hose joints, the latter with the aid of another jig that bolts on the top of the drill press table. The clamp was developed at the Bloomington, Ill., shops of the Gulf, Mobile & Ohio, and it is used principally for drilling and tapping the end cap holes on roller bearing axles.

The holding arrangement consists essentially of a hole



The holding fixture. After the first axle is aligned with a level for drilling by adjusting the back stop the remainder are automatically aligned because the top remains fixed



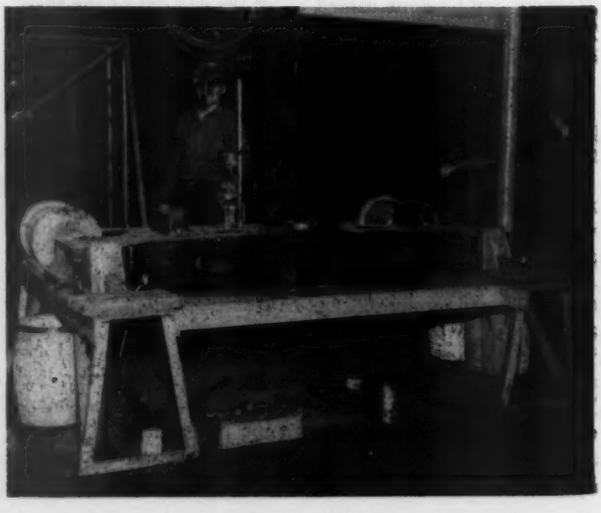
Drilling the end cap holes for roller-bearing axles on a radial drill press with an auxiliary axle-holding fixture

in the floor, in which one end of the axle rests, and a clamping arrangement at the wheel seat portion of the axles for securing the axle in place. The advantage of the arrangement lies principally in eliminating all set-up time after the first axle. This first axle in a lot is set up with a level by adjusting the back stop of the holding fixture, which is mounted on the bed of the drill press. From then on remaining axles are merely clamped in place as the back stop remains in a fixed position. The axle ends are laid out for drilling and tapping the three holes by a drilling jig with a screw chuck that fits over the journal.

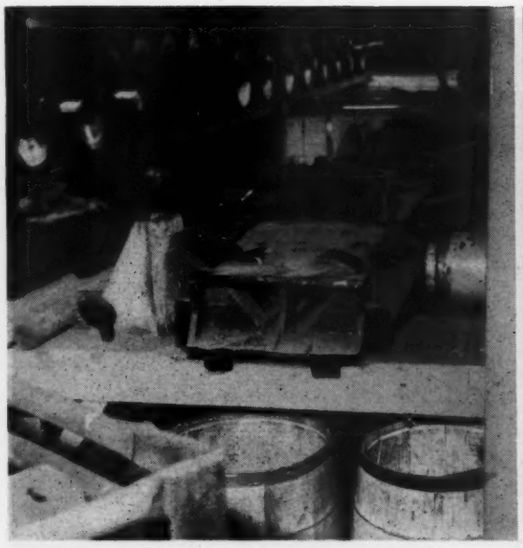
Compressing Freight Truck Friction Shoes

The friction shoe springs on A.S.F. Ride Control trucks are easily compresesd to permit final assembly of the bolster to the truck side frames by an arrangement developed at the Chicago & Eastern Illinois Oaklawn shops in Danville, Ill. The compressing device consists essentially of a frame on which the bloster is mounted and two air cylinders for squeezing the friction shoe springs.

The bloster is set on the frame, and the friction shoes, or wedges, and the springs are placed in the proper position. Air is admitted simultaneously to the two cylinders to compress the friction shoe springs. The spring and wedge assembly is then held in the compresesd position



Arrangement for compressing the friction shoe springs on A.S.F. Ride-Control trucks to permit application of the bolster to the truck side frames



Left—The bolster with the snubbing device in place preparatory to having the springs compressed. Right—When air is admitted to the cylinders, the friction shoe spings on both sides of the bolster are compressed simultaneously, and the springs are held in the compressed position by wrenches with pointed ends

by pointed-end wrenches until the bolster is applied to the truck side frames. When the truck is assembled, the pointed wrenches are removed by prying up on the top of the casting with a 6-ft. steel lever; this applies pressure on the top of the shoe to compress the spring sufficiently to permit the removal of the wrench by hand.

Freight Car Coupler Reclamation

When key slot in the butt end of Type D and E freight car couplers has worn elongated from service, the coupler can be reclaimed for about one-tenth the cost of a new one by the procedure employed by the Southern at Spartanburg, S. C. The butt end of the coupler is heated to between 1,750 and 1,800 deg. F. and a standard key inserted in the slot. A sleeve is applied over the butt end of the coupler placed in an air press where the keyway

Above—A coupler in place preparatory to shortening key slot.

Left—Equipment for returning to standard dimensions key slots in type D and E couplers which have worn elongated in service

is shortened back to A.A.R. standard length. The reduced overall length of the coupler which results from the slot shortening operation is compensated for by welding a plate on the butt end to return to standard the length between the butt end and the horn of the coupler. The die on the air press is so designed that in shortening the keyway the butt end is also squared at the same time to receive the plate which is later welded on. After the plate has been welded in place the entire coupler is normalized at 1,500 to 1,550 deg. F. for one hour per inch of thickness.

The sleeve which fits over the coupler is made of 1⅝-in. plate, 7½ in. deep and generally shaped inside to fit the coupler. The opening of the sleeve is enlarged at the entrance, and part of the key protrudes beyond the entrance so that the workman can observe when the key fits tight in the slot to terminate the shortening operation. The blind end has a 2-in. hole into which a 2-in. round projection of a false bottom fits. This false bottom of 1-in. plate is used to drive the coupler out of the sleeve after the shortening operation with the ram of the air press. A second heading plate pushes the key out of the slot, power for this operation again being supplied by the air press ram.

Shortening is done with a steady force of 145 tons supplied by a vertical air cylinder 20 in. in diameter with a 30-in. stroke through a lever 55 in. long. One end of the lever is 3 in. thick and 10 in. deep and gradually tapers to 2¼ in. thick and 7 in. deep at the other end. The fulcrum is 8 in. from the point of transmittal of the force, or 47 in. from the point of application of the force. The back stop is shaped to mate with the pulling face of the coupler. The stripping piece which holds the coupler for removal of the key is made of 1-in. plate with an opening 7¼ in. by 10¼ in. and with an inside width of 8⅝ in. The main frame of the press is built around an I-beam 7 in. by 24 in. covered with a 1⅜-in. plate.

How the dummy key is removed from the slot after the shortening operation

Heavy-Duty End and Side Straightener

The most stubborn car ends and sides can be straightened with a portable device used at the North Western's Proviso, Ill., car shop. The straightener consists essentially of a removable 50-ton air jack, a 5 in. by 8 in. oak timber which transmits the force of the jack to a length of 2- or 3-in. pipe which fits in the corrugations of the ends, the necessary frame for holding and transporting the jack and timber, and a pair of ratchet hand brake wheels, one for applying and removing the jack, the second for adjusting the oak timber. Means are provided for securing the device to the car coupler, and there are a variety of special hook arrangements to secure the straightener to the bolsters, the side sills or the end sills when desired.

Bulges in the ends near the center are corrected by securing the straightener to the coupler by the knuckle pin with the knuckle removed. For end bulges near the sides of the ends, the straightener is secured to the end sill by one of the special hooks, which are also used to secure the device to the bolster or side sill when straightening the sides.

In all these operations the framing of the straightener is supported on blocks so that the reaction from the application of the straightening force does not break the wheels and axle.

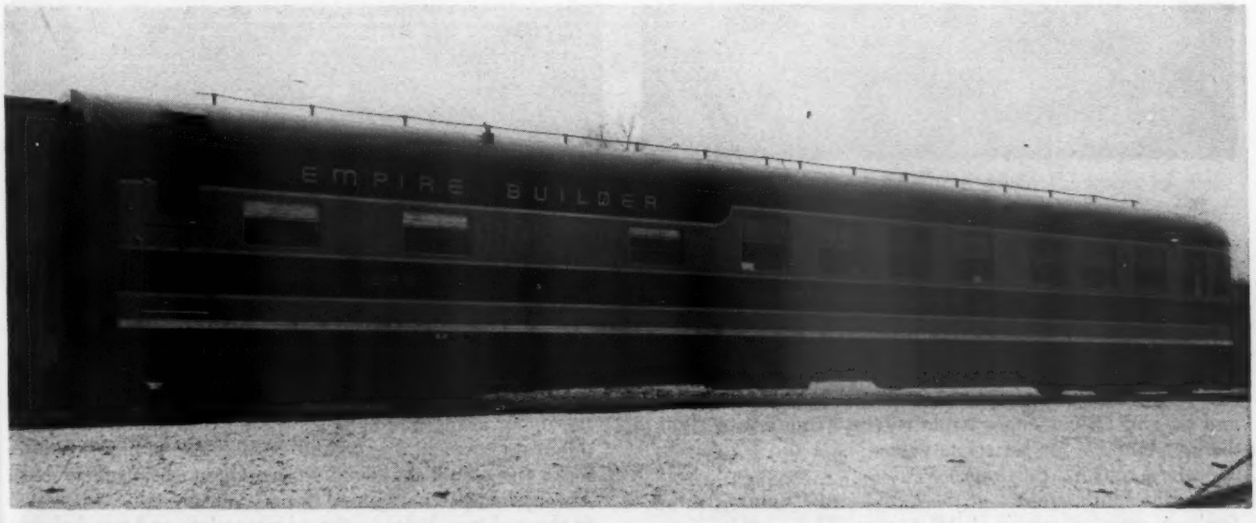
Modification to Duplex Wheel Loader

A typical duplex wheel loader, shown in the illustration, has been modified to permit shortening the arm by 2 ft. while at the same time easing the task of swinging the arm. By reducing the turning effort required, the arm length has been shortened to a little under 6 ft. to permit this type of loader to be used in areas which formerly were too small to allow such installations.

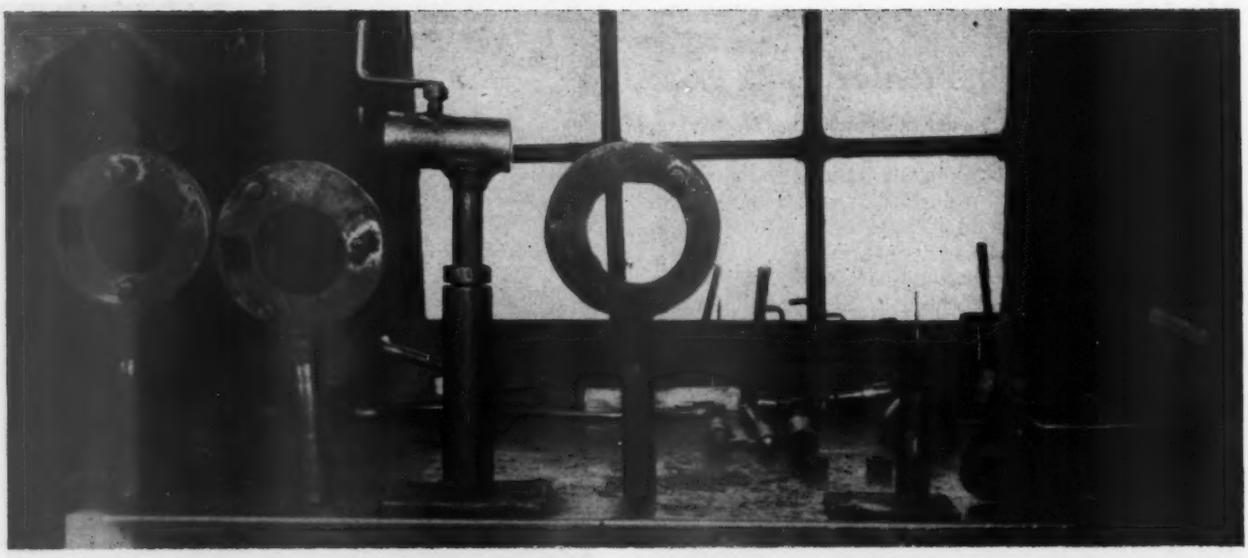
Turning has been made easier by incorporating a ball bearing ½ in. by 4½ in. in an opening bored in the ram, which does not turn. The ball-bearing installation reduces friction and permits easier turning than where the ram itself has to turn while supported by air pressure underneath. The shorter arm also saves several steps each time wheels are loaded or unloaded.

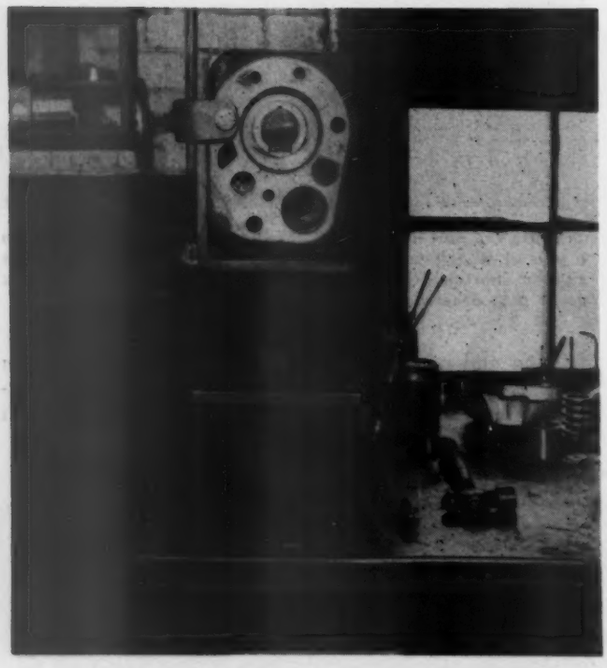
Because the ball bearing reduces the friction necessary to turn a pair of wheels on either end of the duplex loader, the arm can be shortened to allow the use of this type of loader in areas that otherwise would be too small

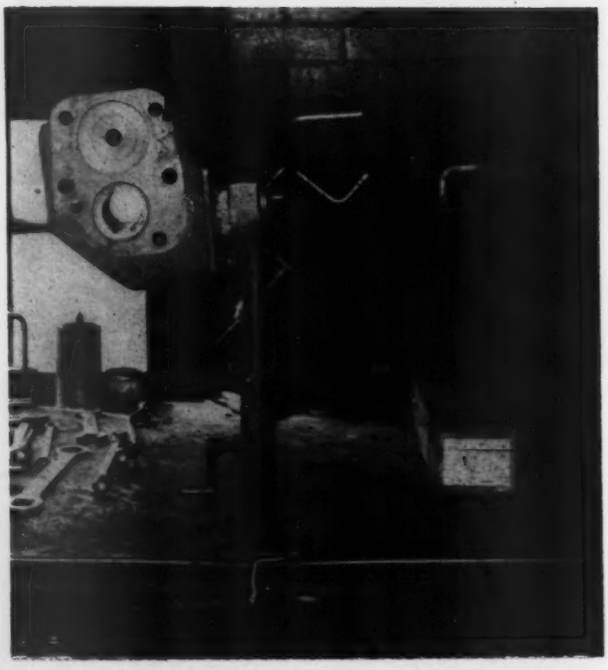
By incorporating the ball bearing in an opening bored in the ram, the ram does not have to turn while supported by the air pressure underneath



Observation-lounge car built by the American Car & Foundry Co. for the new "Empire Builders" of the Great Northern which went into service on June 3. The exteriors of the cars for these trains, which were built by the American Car & Foundry Co. and the Pullman-Standard Car Manufacturing Company, are orange, with olive green skirt, letterboard, roof and ends. Gold striping above and below the windows and the gold lettering is Scotch-Lite.







Holding Stands for Air Brake Parts

The illustration at the top of the page is of an air brake holder which will hold service and emergency portion of AB brakes as well as K1 and K2 freight triple valves and L2 and L3 passenger triple valves. From left to right, the adapters are for K1 triple valves; K2 and L2 valves; L3 valves, and AB portions.

The lower illustration at the left shows a holding stand for emergency portions of AB brakes. The portion is secured in place by slipping the pin through the clamp and tightening the hand wheel. The stand can turn a full 360 deg. and is locked in any position by a nut on the bottom.

The illustration at the top of the page is of an air brake reconditioning AB service portions with permits pivoting about either a horizontal or vertical axis. Tightening the upper crank handle locks the portion against pivoting about its horizontal axis, and tightening the bottom crank locks the stand against pivoting about the vertical axis. The service portion is held to the stand by two bolts which fit through two holes in the adapter plate and two holes in the quick service limiting valve cover.

These devices are in use at the Oelwein, Iowa, shops of the Chicago Great Western.

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives*

Cylinder Heads and Valves

234-Q.—How are the exhaust and inlet connections made to the head? A—The exhaust manifold is clamped to the cylinder head by means of two clamps. The air or inlet connection is an integral part of the head, connecting directly to the air manifold. The joint is sealed by a special gasket and pressure exerted by cylinder head.

235-Q.—Where is the injection nozzle located and how is it fastened? A—The fuel injection nozzle is located in the center of the head and is held in place by a two stud clamp.

236-Q.—Where is the high pressure fuel injection line located? A—It enters the forward part of the cylinder head from the individual fuel pump through a grommet and on to the injection nozzle.

237-Q.—What provision is made for a leak off from the nozzle? A—It is piped directly to a drain header.

238-Q.—How is the cylinder head cooled? A—With water flowing into the head from the cylinder liner jacket and out throug the water outlet manifold.

239-Q.—What assembly is mounted on the head? A—The valve levers and equalizing yokes are mounted on the valve lever bracket which carries the valve lever shafts. The equalizer yokes are guided on the yoke guides which are pressed in the head. The lever assembly is removed from the head as a complete assembly and is totally enclosed by a light weight cover when the head is complete-assembled.

Diesel Engine Piston, Piston Rings and Pins

240-Q.—What type of pistons are used? A—Aluminum alloy.

241-Q.—How many compression rings are applied? A—Three.

242-Q.—What other rings are used? A—Three oil control rings.

243-Q.—Where are the oil control rings located? A—One above and two below the piston pin.

244-Q.—How is the piston cooled? A—By oil received through the connecting rod from the crankshaft.

245-Q.—How is the oil circulated? A—From the crankshaft it passes up the rifle drilled connecting rod, through the hollow piston pin, to special oil circulating passages in the piston.

246-Q.—Where does the oil go from there? A—The hot oil is returned to the engine base through a discharge hole in the piston.

247-Q.—Where is the piston pin bearing applied? A—It is pressed into the eye of the connecting rod.

248-Q.—What kind of a fit is used for the piston pin? A—It is a hand push fit in the piston and a running fit in the connecting rod.

249-Q.—How are the piston pin plugs applied? A—They are a press fit in the piston.

* This series of questions and answers relate specifically to the Alco-G.E. Diesel elec. locomotives.

Steam Locomotive Boilers

By George M. Davies

How Big Should a Rivet Be?

Q.—How is the diameter of the rivets of a locomotive boiler determined? The recommended practices for rivet sizes for various thickness of plate is standardized and universally used. What I would like to know is how the individual rivet size is determined?—B.V.C.

A.—The theoretical or critical diameter of the rivet is based on the possible failure of the rivet. The rivet can fail in either of two ways, namely by shearing or crushing. The formulae for rivet failure due to shearing and crushing is as follows:

(1) Resistance to shear $= \frac{\pi d^2}{4} fs$

(2) Resistance to crushing $dt\,fc$

where

d = diameter of rivets in inches

fs = 44000 pounds per square inch for Steel Rivets in Single Shear.

= 88000 pounds per square inch for Steel Rivets in Double Shear.

fc = 95000 pounds per square inch of projected area in steel plate.

t = thickness of plate in inches.

From the above formulas it will be noted that for a given plate thickness the shearing resistance of a rivet varies with the square of the diameter while the crushing strength varies with the diameter of the rivet. The critical diameter of the rivet for a given thickness of plate is where the strength of the rivet is the same for either method of failure.

To find this critical diameter for a given plate the formulas should be equated

Thus

$$\frac{\pi d^2}{4} fs = dt\ fc$$

$$\text{or } d = \frac{4t\ fc}{\pi fs}$$

By substituting values for (t) in the above formulae the critical diameter of rivet for each thickness of plate can be determined. Rivets smaller than the critical diameter fail by shearing and those larger by excessive bearing pressure.

Drilled Holes in Throat Sheet Cracks

Q.—In applying outside throat sheet patches, it is our practice to vee out the crack and weld the throat sheet prior to the application of the riveted patch. With this procedure is it necessary to drill a hole in the throat sheet at the end of the crack prior to welding the crack?—M.T.Z.

A.—This apparently is a carry over from the practice of drilling a small hole at the end of a crack, to prevent the crack from extending, before applying a riveted patch. It would appear that with the crack vee'd out for welding it should not be necessary to drill holes to determine the ends of the crack.

Locating the Bottom Gage Cock

Q.—Our electric locomotives are equipped with 40" diameter vertical firetube steam heat boilers. On this type of boiler how is the location of the bottom gage cock above the firebox tube sheet determined?—C.C.P.

A.—The bottom gage cock of a vertical firetube boiler is located not less than two inches above the danger line. The danger line is located, not less than one-half the distance over the tube sheets, above the firebox tube sheet. Thus for a vertical firebox boiler having $35\frac{7}{8}$ inches over tube sheets, the danger line would be $17\frac{15}{16}$ inches above the firebox side of the firebox tube sheet and the lowest gage cock would be located at least $17\frac{15}{16}$ inches plus 2 inches = $19\frac{15}{16}$ inches above the firebox tube sheet measured from the firebox side of the sheet.

The I.C.C. Rules governing the inspection and testing of locomotives, other than steam provides as follows:

Rule 317 (a) Every steam boiler shall be equipped with at least one water glass, and three gage cocks which can be easily opened and closed by hand. The lowest gage cock and the lowest reading of the water glass and the line on the badge plate shall correspond and be not less than two inches above the danger line. The danger line shall be that at which there will be no danger of overheating any part of the boiler. The danger line for vertical firetube boilers shall be not less than one-half the length of the tube above the lower tube sheet: and for vertical submerged tube boilers, the upper surface of the top tube sheet.

Schedule 24 RL
Air Brakes

TRAIN CONTROL OPERATION (*continued*)

1141-Q.—To where does the charging air from the N.S.1-reducing valve flow? A.—Through the strainer and pipe *1* to the timing valve.

1142-Q.—What does the timing valve consist of? A.—A pipe bracket *(2)* on which is mounted magnet *(234)* for receiving the train stop or cab signal indication, the timing valve portion *(80)*, with its control piston *(90)* and valves *(82)* and *(83)* for operation of the brake valve service application piston, a signal whistle which blows when the timing valve operation is initiated and the safety valve *(38)*, which protects the timing valve against excessive pressure. Ball check valve *(27)* with choked bushing *(25)*, which permits quick charging of the chamber below piston *90*, but restricts flow in the reverse direction to the desired amount.

1143-Q.—When is the timing valve magnet energized? A.—When the system is charged and the signal does not call for a train control application.

1144-Q.—What happens when the magnet valve is energized? A.—Upper exhaust valve *240* is moved down on its seat to cut off the exhaust and lower valve *243* is unseated.

1145-Q.—What is the result of this movement? A.—Reducing valve air is permitted to flow past ball check *27*, which is unseated, and the chamber below piston *90* is charged.

1146-Q.—What is the result of charging the chamber below piston 90? A.—The piston is moved to its upper position.

1147-Q.—What is accomplished by the upward movement of piston 90? A.—The upper valve *82* is seated, preventing flow of main reservoir air from pipe *4*.

1148-Q.—Explain how the train control system is charged. A.—Main reservoir charging air from chamber *A* below service application piston *112* of the brake valve, flows through choke *K* of the piston to chamber *B*, passage *10*, pipe 10, through the cut-out cock with seal, to pipe connection *4* and enters the timing valve, flowing to the top of upper valve *82*, which is seated as long as piston *90* is in its upper position.

1149-Q.—What brings about de-energization of the timing valve magnet? A.—It is de-energized from a train control signal.

1150-Q.—What is the result when the magnet is de-energized? A.—A train control application is initiated.

1151-Q.—What is the first resulting movement? A.—Spring *246* moves supply valve *243* upward to its seat, cutting off reducing valve air.

1152-Q.—What additional operation results? A.—The upper exhaust valve *240* is unseated.

1153-Q.—With the exhaust valve unseated, what then follows? A.—Air below piston *90* is permitted to flow through choke *X*, past unseated exhaust valve to the timing valve whistle and then to atmosphere.

1154-Q.—When the whistle blows, what does it indicate? A.—It is an indication that a train control application has been initiated.

1155-Q.—As the flow of air continues, what happens? A.—The air in the chamber acting on piston *90* is reduced and spring *92* moves the piston to its lower position.

1156-Q.—Does this happen immediately? A.—A time interval of approximately six seconds (due to choke *X* at ball check valve *27)* is required before the air in the chamber acting on piston *90* is reduced sufficiently to permit the spring to move the piston downward.

1157-Q.—What results from the downward movement of piston 90? A.—When the piston is moved to its lower position, spring *88* moves upper valve *82* and lower valve *83* downward.

1158-Q.—What flow of air then results? A.—When lower valve *83* is seated, the stop reservoir is closed off from exhaust and upper valve *82* is unseated, permitting air from chamber *B* on top of brake valve application piston *112* to be vented.

1159-Q.—Explain how the air from chamber B is vented. A.—Through passage *10*, pipe *10*, through the cut-out cock with seal, passage *4* in the timing valve, past the unseated upper valve *82* into passage *5*.

1160-Q.—What determines further flow of air at this juncture? A.—It depends on whether or not a suppression valve is used.

ELECTRICAL SECTION

Battery Trucks in Storehouse Service

The Norfolk and Western's new storehouse at Roanoke, Va.

Practically all the material handled in the new Norfolk and Western storehouse is moved on pallets or in skid boxes by electric trucks

STORAGE battery electric trucks are used to handle nearly all of the material used at the Norfolk and Western's new storehouse at Roanoke, Va. The storehouse is a four-story structure, 70 ft. wide and 480 ft. long, and includes 130,000 sq. ft. of floor space—nearly three acres.

For movement of material in the building, to and from freight cars, and to platforms for delivery to the shops, there are seven fork-lift trucks and four lift-platform trucks. Two of the fork-lift trucks are equipped with 30-cell, type D7, 525 amp.-hr. Edison storage batteries. The five smaller fork-lift trucks and the four lift-platform trucks each use 10-cell, type C8, 450 amp.-hr. Edison batteries. With the principal exception of heavy items such as reels of wire rope, main and side rods, piston rods, etc., which are handled by an overhead crane spanning a part of the first floor of the storehouse, material is carried into and out of storage by the electric battery trucks.

On one side of the building, a loading and unloading platform acccommodates 12 box cars, while a recess on the other side provides space for six highway trucks and, when roller doors are lowered at both floor and ground level, serves also as a garage for company-owned trucks. No gasoline-propelled equipment is otherwise stored in this building. Material is moved between the storehouse and the shops by both highway trucks and tractor-trailer trains which make hourly trips.

Pallets and Skid Boxes

In general, material received or shipped by rail is carried on pallets by fork-lift trucks while material going to or from the various departments of Roanoke Shops is handled mainly in skid boxes by either fork- or platform-lift trucks, since skid boxes are used in the industrial-truck handling system in all departments of the shops. In both cases, virtually all material is carried into and out of stock in unit pallet or skid loads.

Material received by rail is piled on pallets in the cars and, when the quantity warrants, is tiered in storage on

The charging station on the first floor of the storehouse

pallets. Examples of material handled in this manner include soap, stoves, brooms, journal boxes, paper towels, bearings, jacks, shovels, nuts, bolts, nails, welding wire and bagged asbestos cement. The pallets employed are 48 by 48 in.

Material received in small lots is combined with one or more other small lots into mixed pallet loads which are carried to the receiving clerk for recording, checking, etc. The material is then reclassified as necessary and made up into other mixed pallet loads for delivery to the various sectional storekeepers. Material for outlying points is shipped on specified days and is carried from storage to outgoing cars by the reverse of the same procedure. In this way, virtually all material, regardless of the quantity, is handled both in and out by power trucking. Hand trucking has been virtually eliminated except for small, light items of material required for rush orders.

Charge Indicator Table for use with Type D7 Batteries (Normal rate 105 amp.)

Test fork Reading	Control of Charge: Ampere-hour Meter setting	Control of Charge: Time at 105 amp. Hours : min.
1.27	50	0:40
1.24	105	1:20
1.22	160	2:00
1.20	210	2:30
1.19	260	3:10
1.17	315	3:50
1.16	365	4:30
1.14	420	5:00
1.12	470	5:40
1.09	525	6:20
Below 1.09	590	7:00

If the test fork reading is between any two of the values indicated in this chart, the lower one is used.
The battery is allowed to stand at least one-half hour after discharge to permit the cells to stabilize. The prong of the fork is pushed over the contact pieces and the meter read after 10 seconds.

Similarly, material to and from the various departments of Roanoke Shops is handled in and out of storage in unit loads, with small lots being combined into mixed loads except that, as already mentioned, skid boxes are used instead of pallets. Handled in skid boxes are such things as valves, angle cocks, cut-out cocks, globe valves, brake beams, equalizers, etc.

The storehouse is served by four elevators, including two large freight elevators with automatic controls that can accommodate a truck with skid or pallet load. Depending upon circumstances, therefore, the trucks either may ride the elevators with their loads or may place them aboard for pickup by other trucks on the destination floors.

Battery Charging

A battery charging station is located on the first floor adjacent to the truck recess. It provides six charging circuits for 10-cell batteries as used in the "walkie" trucks and one charging circuit for 30-cell batteries as used in the larger fork trucks which handle the heavier loads. All circuits are provided with controls for fully automatic charging.

One of the larger fork-lift trucks powered by a 30-cell battery

The four vertical m.g. chargers are type BE-10-1 machines made by the Electric Products Company, each designed to charge one 10-cell, 338/450 amp-hr. Edison bat-

Left: A lift-platform truck without load at the charging station. Right: Two of the "walkie" fork-lift trucks without load and with batteries on charge

tery in seven hours. The maximum charging rate is 110 amp. The two horizontal sets at the left end of the row shown in one of the illustrations are Model 670-10-1 machines made by the Motor Generator Corporation, Troy, Ohio, and designed to charge a 10-cell, 450 amp.-hr. Edison battery in seven hours. The current rating is 126 to 70 amp. The 30-cell charger at the right, made by the Electric Products Company, is rated 60 volts and 147/62 amp.

The amount of charge to be applied to the 30-cell trucks is controlled by an amp.-hr. meter. The amount of charge for the 10-cell batteries is determined by checking their state of charge with an Edison test fork. The charge test fork affords a means of determining the state of charge quickly and with reasonable accuracy, and thus permits giving each battery the correct amount of current input to restore it to a fully charged condition.

In operation, the instrument measures the voltage delivered by a pilot cell across a resistor having a temperature-resistance coefficient so low, its resistance remains virtually constant throughout the normal temperature range. This, together with the fact that the voltage of the Edison cell at a given current rate bears a known relationship to its state of charge, forms the basis of the operation of the instrument. From the voltage reading of the pilot cell, the state of charge of the battery and the current input required to restore the battery to a charged condition, are then determined by reference to the charge indicator table furnished with the instrument. Charging time and amp.-hr. setting for D-7 batteries are given in the table.

Each set is equipped with a time clock, or amp.-hr. meter. This is set in accordance with the voltage reading. The time clock is set to the proper value, the battery connected, and the machine started manually. The time clock shuts it down automatically when the charge is complete.

Interior view of the storehouse showing one of the lift-platform trucks carrying a loaded skid-box

Storehouse in one end of former flue shop provided space for material used in repair shop operations

Bearing assembly room with glass fronted cabinets for storage of new and reworked assemblies

Motor Shop Records As Kept by the Southern

Facilities developed by the Southern for maintaining diesel electrical equipment were described in the May issue of *Railway Mechanical and Electrical Engineer*. Operation of the shop was covered in the June issue. Some of the forms used for inspection and procedures during the repair and overhaul of motors and generators are shown on the following page. In addition, a record card, Form 1170, acts as the master record for each motor, listed under the serial number of the motor. Originally each diesel repair shop maintained a card of this sort in a permanent file, but with the large number of motors in service and the fact that they were frequently transferred from one territory to another, this arrangement did not prove satisfactory. The present procedure is to hold Form 1170 for a motor of a given serial number in a file in the diesel shop office of the territory where the motor is in service. When the motor is removed from service, the data on mileage is entered on the card, which is then mailed to the location where the motor is shipped. For example, if a motor is removed at Chattanooga for mileage overhaul, the clerk in the shop office fills in total mileage made by the motor between the time it was installed on the locomotive and the time it was removed. When the motor is shipped to Atlanta for overhaul, the card is mailed to the foreman of the traction motor shop, together with a notation as to whether the motor is removed for mileage overhaul or defect.

When the motor is shipped from Atlanta to Chatta-

20M 5-47 FORM 1170

SOUTHERN RAILWAY SYSTEM

SERIAL NO._____

Traction Motor Record

MAKE_____TYPE_____PINION_____DATE REC'D_____TERMINAL_____

LOCOMOTIVE NUMBER	UNIT	PED.	INSTALLED		REMOVED		MOTOR MILEAGE	MOTOR MI. SINCE LUBRICATION	REASON REMOVED
			DATE	LOCOMOTIVE MILEAGE	DATE	LOCOMOTIVE MILEAGE			

Master record card for traction motors filed under the motor serial number. The master record card is maintained in a file in the territory where the motor is in service

nooga or any other point on the system, the card is mailed to the corresponding master mechanic. Printed memorandum forms are used for transmittal.

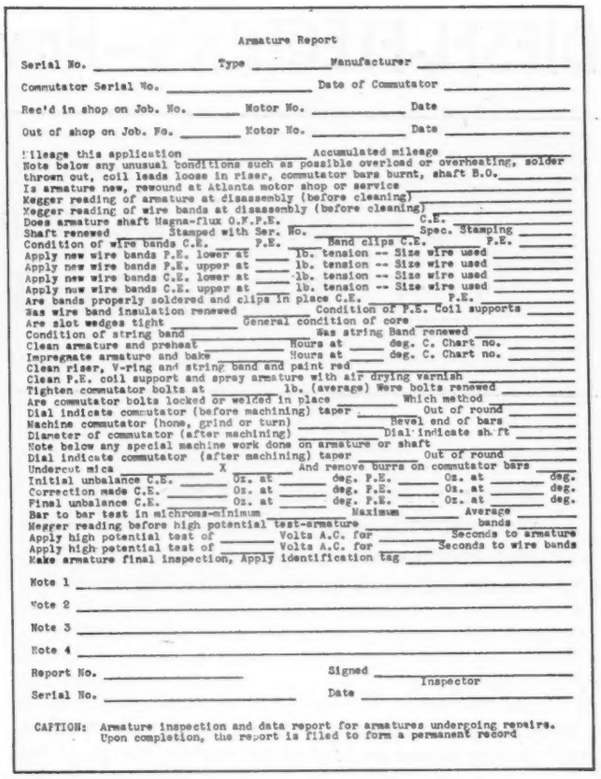
Miscellaneous Repair and Overhaul

The procedure and operations discussed for traction motor repairs also apply for main generator mileage overhaul or rewinds. The machinery and equipment installed has sufficient capacity for the larger generator frame and armatures, and essentially the same procedure is followed in the overhaul and rewinding operations.

Provisions have also been made for repair work on auxiliary generators, alternators, small accessory motors and control equipment, most of which work is concentrated at Atlanta for the entire system. Traction motor blower, cooling fan, pump and other auxiliary motor armatures are rewound when required in a separate section of the shop.

Space was made available in one end of what was formerly a flue shop, and a storehouse has been provided to serve the repair shop operation. All material, parts and supplies necessary for this work are stocked in this location, eliminating the necessity of sending an employee to the main storehouse for necessary material. The saving in time of mechanics is sufficient to justify maintenance of a storehouse attendant during shop working hours.

Experience with the design, construction and operation of this repair shop has demonstrated the importance of planning the initial layout so that adequate space will be available for future expansion.



Armature Report

Serial No. _____ Type _____ Manufacturer _____

Commutator Serial No. _____ Date of Commutator _____

Rec'd in shop on Job. No. _____ Motor No. _____ Date _____

Out of shop on Job. No. _____ Motor No. _____ Date _____

Mileage this application _____ Accumulated mileage _____

Note below any unusual conditions such as possible overload or overheating, solder thrown out, coil leads loose in riser, commutator bars burnt, shaft B.O. _____

Is armature new, rewound at Atlanta motor shop or service _____

Megger reading of armature at disassembly (before cleaning) _____

Megger reading of wire bands at disassembly (before cleaning) _____

Does armature shaft Magna-flux O.K. P.E. _____ C.E. _____

Shaft renewed _____ Stamped with Ser. No. _____ Spec. Stamping _____

Condition of wire bands C.E. _____ P.E. _____ Band clips C.E. _____ P.E. _____

Apply new wire bands P.E. lower at _____ lb. tension -- Size wire used _____

Apply new wire bands P.E. upper at _____ lb. tension -- Size wire used _____

Apply new wire bands C.E. lower at _____ lb. tension -- Size wire used _____

Apply new wire bands C.E. upper at _____ lb. tension -- Size wire used _____

Are bands properly soldered and clips in place C.E. _____ P.E. _____

Was wire band insulation renewed _____ Condition of P.E. Coil supports _____

Are slot wedges tight _____ General condition of core _____

Condition of string band _____ Was string Band renewed _____

Clean armature and preheat _____ Hours at _____ deg. C. Chart no. _____

Impregnate armature and bake _____ Hours at _____ deg. C. Chart no. _____

Clean riser, V-ring and string band and paint red _____

Clean P.E. coil support and spray armature with air drying varnish _____

Tighten commutator bolts at _____ lb. (average) Were bolts renewed _____

Are commutator bolts locked or welded in place _____ Which method _____

Dial indicate commutator (before machining) taper _____ Out of round _____

Machine commutator (hone, grind or turn) _____ Bevel end of bars _____

Diameter of commutator (after machining) _____ Dial indicate shaft _____

Note below any special machine work done on armature or shaft _____

Dial indicate commutator (after machining) taper _____ Out of round _____

Undercut mica _____ X _____ And remove burrs on commutator bars _____

Initial unbalance C.E. _____ Oz. at _____ deg. P.E. _____ Oz. at _____ deg.

Correction made C.E. _____ Oz. at _____ deg. P.E. _____ Oz. at _____ deg.

Final unbalance C.E. _____ Oz. at _____ deg. P.E. _____ Oz. at _____ deg.

Bar to bar test in michroms-minimum _____ Maximum _____ Average _____

Megger reading before high potential test-armature _____ bands _____

Apply high potential test of _____ Volts A.C. for _____ Seconds to armature

Apply high potential test of _____ Volts A.C. for _____ Seconds to wire bands

Make armature final inspection, Apply identification tag _____

Note 1 _____

Note 2 _____

Note 3 _____

Note 4 _____

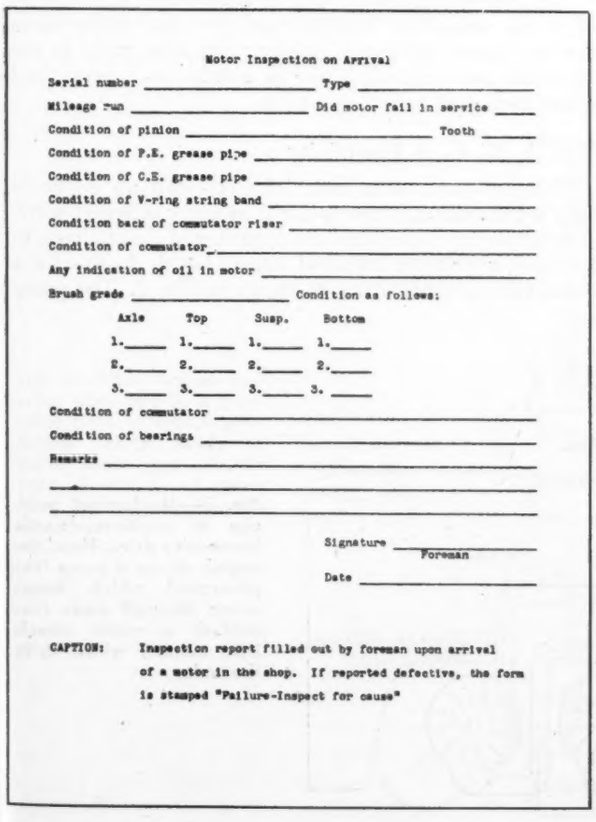
Report No. _____ Signed _____ Inspector

Serial No. _____ Date _____

CAPTION: Armature inspection and data report for armatures undergoing repairs. Upon completion, the report is filed to form a permanent record

Above: Armature inspection and data report for armatures undergoing repairs. Upon completion, the report is filed to form a permanent record. Below: Field coil and frame report for a record of condition and work done on a frame being overhauled

Inspection report filled out by foreman upon arrival of a motor in the shop. If reported defective, the form is stamped "Failure—Inspect for cause"



Motor Inspection on Arrival

Serial number _____ Type _____

Mileage run _____ Did motor fail in service _____

Condition of pinion _____ Tooth _____

Condition of P.E. grease pipe _____

Condition of C.E. grease pipe _____

Condition of V-ring string band _____

Condition back of commutator riser _____

Condition of commutator _____

Any indication of oil in motor _____

Brush grade _____ Condition as follows:

Axle	Top	Susp.	Bottom
1._____	1._____	1._____	1._____
2._____	2._____	2._____	2._____
3._____	3._____	3._____	3._____

Condition of commutator _____

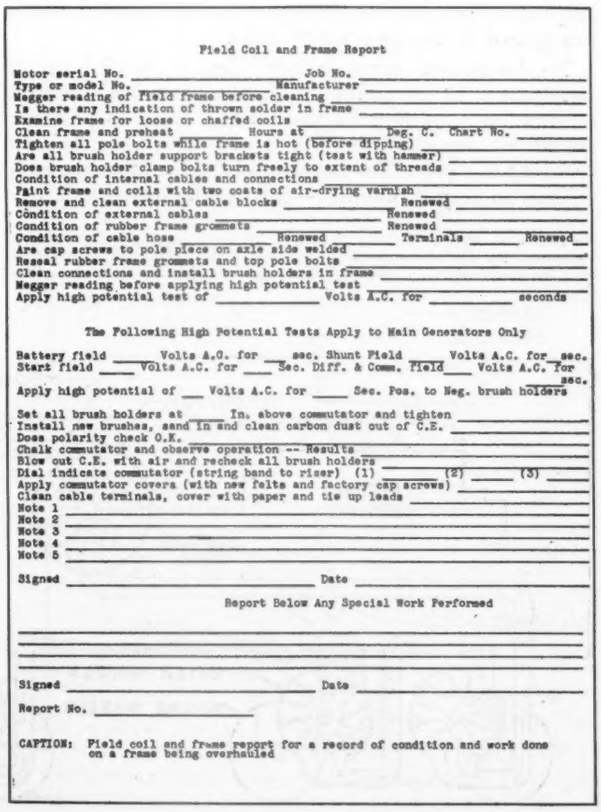
Condition of bearings _____

Remarks _____

Signature _____ Foreman

Date _____

CAPTION: Inspection report filled out by foreman upon arrival of a motor in the shop. If reported defective, the form is stamped "Failure-Inspect for cause"



Field Coil and Frame Report

Motor serial No. _____ Job No. _____

Type or model No. _____ Manufacturer _____

Megger reading of field frame before cleaning _____

Is there any indication of thrown solder in frame _____

Examine frame for loose or chaffed coils _____

Clean frame and preheat _____ Hours at _____ Deg. C. Chart No. _____

Tighten all pole bolts while frame is hot (before dipping) _____

Are all brush holder support brackets tight (test with hammer) _____

Does brush holder clamp bolts turn freely to extent of threads _____

Condition of internal cables and connections _____

Paint frame and coils with two coats of air-drying varnish _____

Remove and clean external cable blocks _____ Renewed _____

Condition of external cables _____ Renewed _____

Condition of rubber frame grommets _____ Renewed _____

Condition of cable hose _____ Renewed _____ Terminals _____ Renewed _____

Are cap screws to pole piece on axle side welded _____

Reseal rubber frame grommets and top pole bolts _____

Clean connections and install brush holders in frame _____

Megger reading before applying high potential test _____

Apply high potential test of _____ Volts A.C. for _____ seconds

The Following High Potential Tests Apply to Main Generators Only

Battery field _____ Volts A.C. for ___ sec. Shunt Field _____ Volts A.C. for sec.

Start field _____ Volts A.C. for ___ Sec. Diff. & Comm. Field ___ Volts A.C. for ___ sec.

Apply high potential of ___ Volts A.C. for _____ Sec. Pos. to Neg. brush holders

Set all brush holders at _____ In. above commutator and tighten _____

Install new brushes, sand in and clean carbon dust out of C.E. _____

Does polarity check O.K. _____

Chalk commutator and observe operation -- Results _____

Blow out C.E. with air and recheck all brush holders _____

Dial indicate commutator (string band to riser) (1) _____ (2) _____ (3) _____

Apply commutator covers (with new felts and factory cap screws) _____

Clean cable terminals, cover with paper and tie up leads _____

Note 1 _____

Note 2 _____

Note 3 _____

Note 4 _____

Note 5 _____

Signed _____ Date _____

Report Below Any Special Work Performed

Signed _____ Date _____

Report No. _____

CAPTION: Field coil and frame report for a record of condition and work done on a frame being overhauled

DIESEL-ELECTRICS—How to Keep 'Em Rolling

1 Fundamentals Helpful in Maintaining Electrical Equipment*

When a few principles are really understood, the work of maintaining electrical equipment on diesel locomotives is made relatively easy

THE diesel-electric locomotive is a sturdy, economical, willing workhorse. Its precision-built engine is one of the most efficient means we have of turning the energy of fuel into mechanical power. Its specially designed electric transmission has unequaled flexibility and automatic adjustment to all conditions of speed and load.

Electric and mechanical equipment, in about 50-50 proportions, makes up the locomotive. The diesel engine develops mechanical power which is used to drive the main (traction) generator. Electric power from this generator operates the driving (traction) motors which are geared to the locomotive axles.

No locomotive earns money when it is tied up at terminals or in the backshop. It is to everyone's interest to keep motive power on the road as much as possible. Intelligent maintenance will go a long way toward reaching this goal. The problem of the maintenance man —"how to keep it running"—can best be solved by learning "what keeps it from running." A large percentage of electrical failures on locomotives are caused by one or more of the following:

1. Loose electric connections
2. Lack of cleanliness of equipment
3. "Monkeyitis"
4. Lack of knowledge of electrical equipment

Good maintenance will prevent failures from the first two causes. Education is the answer to the other two. A man is naturally curious about the equipment with which he works. If he cannot get proper information about it, he will try to find out for himself how it works. Then he is likely to make an "adjustment" to the equipment which prevents it from working properly. This is often called "monkeyitis." Obviously if a man knows what a piece of equipment is, how it works, and what it is used for, he will not be curious about it and will not be tempted to monkey with it.

Failures arising from "lack of knowledge" can also be cured by education. The railroad man who understands the few simple principles of electricity that apply to the diesel-electric locomotive will be able to do a better and more intelligent maintenance job.

The A, B, C of Electricity

Nobody knows what electricity is;—but we do know how it behaves, and how to use it in many different ways. A good way to understand the behavior of electricity is to compare it with the action of water. Let us do this for a diesel-electric locomotive, as shown in Fig. 1. The pump

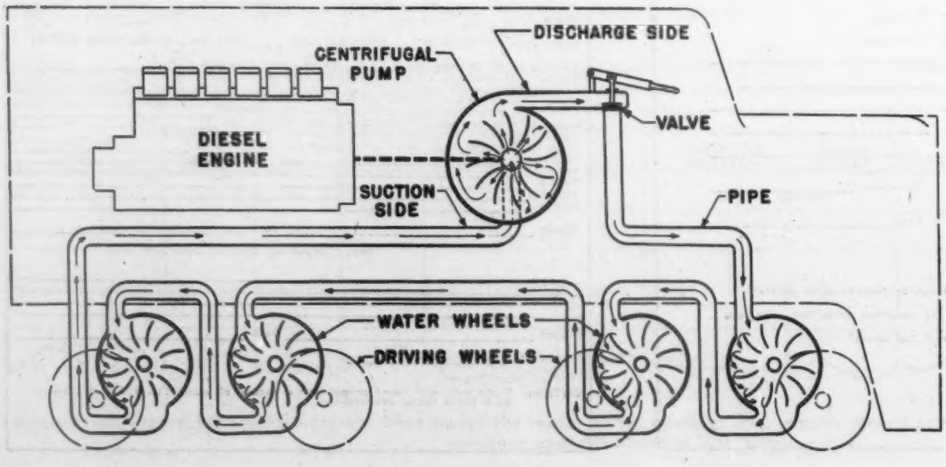


Fig. 1—Mechanical analogy of a diesel-electric locomotive drive. Here, the engine drives a pump (the generator) which forces water through pipes (the cables) to water wheels (the motors) which drive the axles

* This is the first of a series of articles on maintenance of diesel-electrical equipment. The first article is written by Harry R. Hill, Technical Service Division, Locomotive and Car Equipment Divisions, General Electric Company, Erie, Pa.

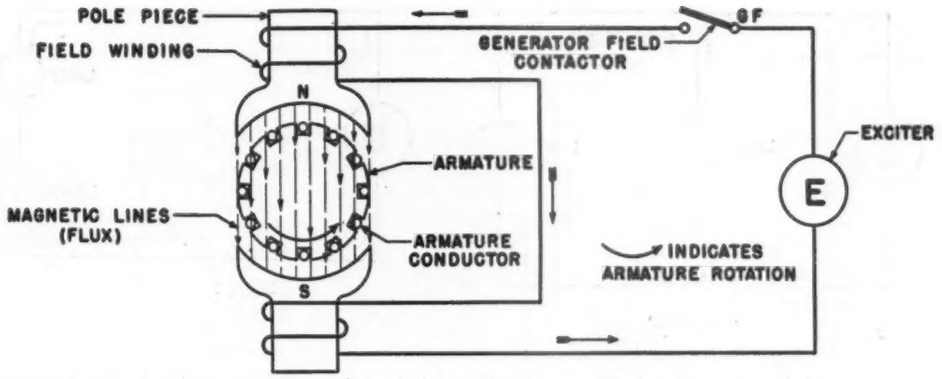


Fig. 2 — Schematic diagram of a generator showing how the armature conductors cut trrough the magnetic lines of force between the pole pieces

corresponds to the traction generator, the water wheels to the traction motors, and the pipes to the connecting cables.

At first, let us assume that the diesel engine is idling with the valve closed (line switch open). Then the pump (generator) is producing pressure (voltage), but there is no flow of water (current), so the water wheels (motors) do not revolve.

Now suppose the throttle is moved to the first notch. This opens the valve (closes the power contactors), and water (current) begins to flow. This flow causes pressure against the blades of the water wheels. If the locomotive has a heavy train, the pressure (voltage) will not be enough to move the wheels.

The engineman now notches up his throttle. The diesel engine speeds up, and the pump pressure (voltage) increases. This causes more water (current) to flow through the water wheels (motors). He continues notching up the throttle until there is enough gallons per minute (amperes) flowing to start the wheels turning. As they revolve, the locomotive and train begin to move. As the engineman continues to advance his throttle, the diesel engine speeds up, pressure and flow increase, and the locomotive accelerates.

Magnetism

The operation of both generators and motors depends upon magnetism. Early investigators found that when a wire was moved near a magnet, an electric voltage was generated in the wire. This principle applied to a generator or motor is shown in Fig. 2. The pole pieces are magnetized by the flow of current through the coil of wire wrapped around each one.

If a compass were placed in the space between the poles, the needle would turn until it pointed toward the north pole (N). This shows the presence of a magnetic field between the poles. When we place a set of conductors wound on an iron cylinder (armature) in this magnetic field, we have a simple electric machine.

Generator Action

Let us suppose that the machine in Fig. 2 represents the main generator on the locomotive. The coils on the pole

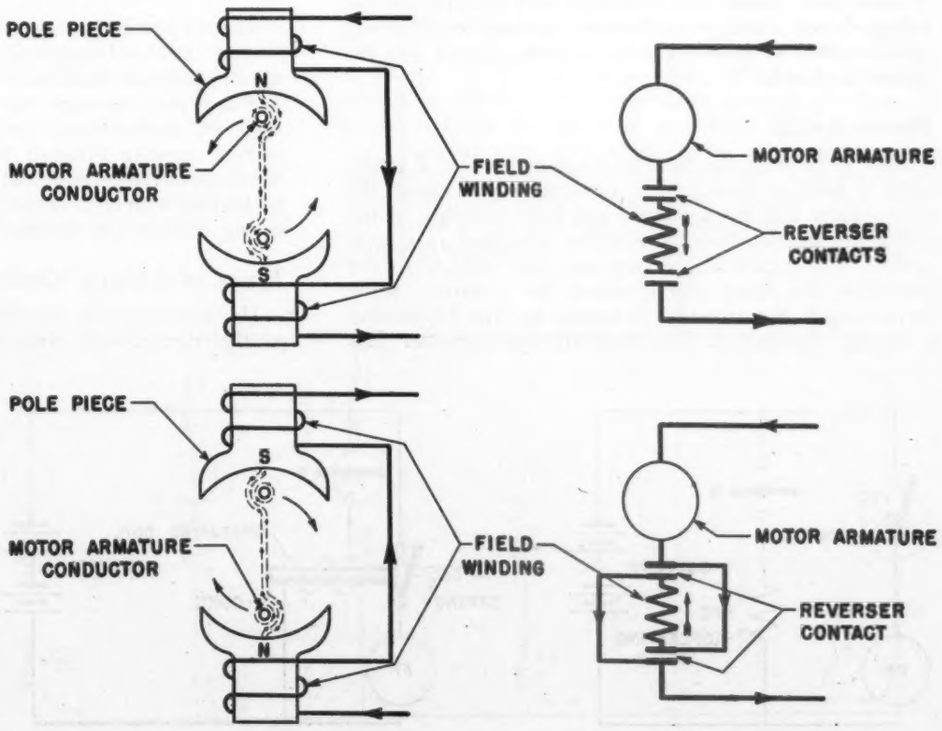


Fig. 3—When current carrying wires are in a magnetic field, a force is generated which tends to move them out of the field. Directions of movement depends on direction of current flow

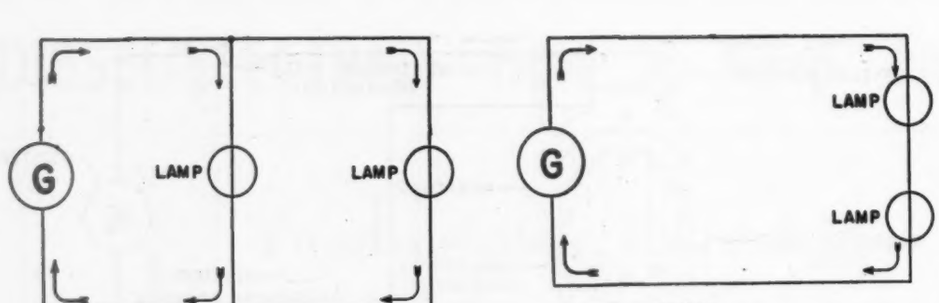


Fig. 4—Parallel and series circuits. In the former, half the current flows through each lamp. In the latter, all the current flows through both lamps

pieces would then be called the "generator field winding." The current which passes through them would be the "field current." Passing this current through the field winding would be called "exciting the field." Therefore, the small generator, *E*, which supplies this current is called the "exciter." The main generator armature is coupled to the diesel engine crankshaft. As the engine runs, the armature conductors move in the magnetic field and generate voltage. The faster the conductors move, the greater the voltage they will generate. Also, the stronger the field, the greater the voltage. The field strength can be increased by increasing the field current (excitation).

The rules for generating voltage are: Rotate the armature and excite the field. The rules for changing the voltage are: Change the armature speed, or the field current, or both at the same time.

Voltage generated in the armature conductors is useful only if it can be made to send current through the traction motors. To do this, we must connect the rotating armature conductors to the motor circuit. This is done by the commutator and brushes.

The front end of each conductor is connected to a copper bar in the commutator. The brushes are held in a fixed position and slide on the commutator as it revolves. When a pair of bars makes contact with the brushes, the voltage in the armature conductors connected to them will cause current to flow, if the line switch, (Fig. 1), to the motor is closed.

Motor Action

Now let us suppose that the machine in Fig. 2 represents a traction motor. The construction is about the same except that the armature and field structure of the motor are smaller than those of the generator in a locomotive. The action of the two machines differs. In the generator, the diesel engine turned the armature, while in the motor, the armature is caused to turn by passing a current through it. This depends upon another fact discovered by early investigators. When a current passes through a wire, it sets up a magnetic field around the wire. This happens when current is sent through the armature conductors of the motor. The magnetic field caused by this current reacts with the magnetic field set up by the pole windings and causes the armature to rotate.

The rule for motor rotation is: when a conductor carrying a current is in a magnetic field, it tends to move out of that field. The direction of the motion depends upon the direction of the magnetic fields.

The reason for this can be seen from Fig. 3. Imagine the magnetic field set up by the poles of the motor to be like a lot of rubber bands stretched between the pole pieces. When a current flows through the armature conductors, the magnetic action pushes some of these "rubber bands" to one side, as shown in the upper half of Fig. 3. This sets up a force which turns the armature in the direction of the large arrows. If the direction of the field is reversed, the magnetic action of the armature will push the "rubber bands" to the opposite side and the armature will turn in the reverse direction, as shown in the lower half of Fig. 3. In the case of locomotive traction motors, this reversal is obtained by interchanging the connections of the motor field, as shown to the right in Fig. 3.

Motors of this type are called "series-wound" or simply "series" motors because the armature and field windings are so connected that all of the current flows first through one and then through the other. They are universally used on diesel-electric locomotives because the heavy current passing through both the armature and field windings develops powerful magnetic fields. These fields push apart with such force that the motor develops a very strong "torque," or turning effort at starting.

Types of Electric Circuits

The two types of circuits—the series circuit and the parallel circuit—are illustrated in Fig. 4.

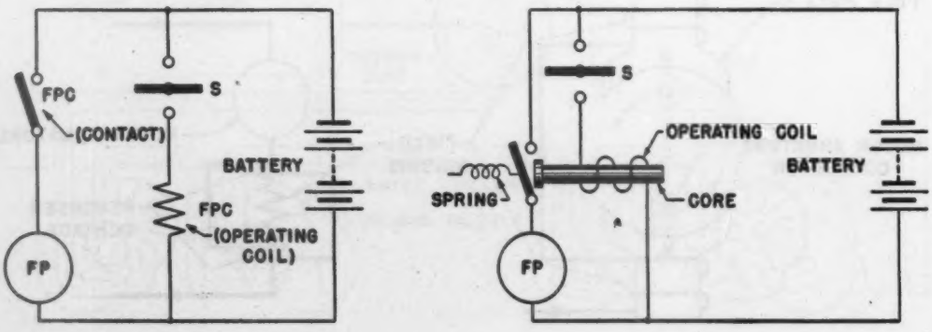


Fig. 5—At the left is a schematic diagram of the circuits used to control a fuel pump motor. At the right is a diagrammatic sketch showing the same thing

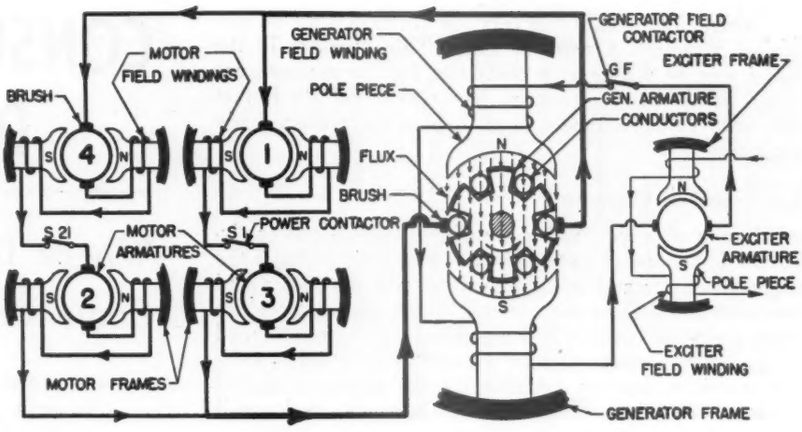
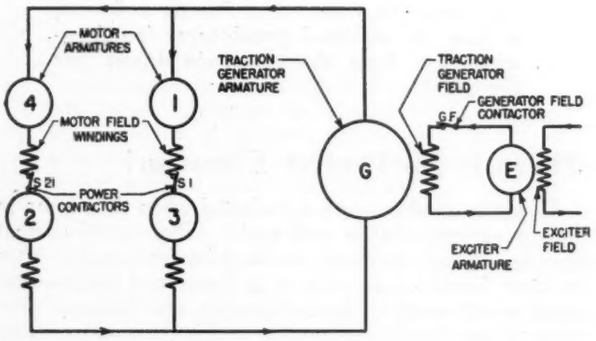


Fig. 6 (right)—Main power circuits of a diesel-electric locomotive

Fig. 7 (below)—The way the power circuits of Fig. 6 are shown in a wiring diagram



The series circuit is shown on the right. In it all of the current delivered by the generator flows through each piece of apparatus in the circuit. However, only part of the voltage is used by each piece of apparatus. If the voltages used by the separate pieces are added together, the sum will equal the voltage of the generator.

The parallel circuit is illustrated on the left. In it each piece of apparatus receives only part of the total current, but each receives full voltage from the generator. If both pieces have the same resistance, the current will divide equally between them, each receiving half of the total current.

These two types of circuits may be combined into what is known as the series-parallel circuit. This is used in the power circuits of many diesel-electric locomotives as will be explained shortly.

Contactors and Relays

As we have already seen, voltage can cause a current to flow only if the electric circuit is complete. A complete circuit, containing a power contactor *GF*, is shown in Fig. 2.

A power contactor is nothing more than a remotely controlled switch. The right half of Fig. 5 illustrates diagrammatically a simple control circuit which operates a contactor to start a fuel pump motor. When the switch S is closed, battery current flows through the operating coil of the contactor. This magnetizes the core and pulls the contact to the closed position to permit current to reach the fuel pump motor. Such a contactor is called a magnetic contactor. It is used in circuits where the current is small. The left half of Fig. 5 shows how this same circuit would appear in a schematic diagram.

When a contactor is used in a traction motor circuit it will be called upon to pass very heavy currents and it is important that the contact tips be pressed together very tightly. For this reason, contactors operated by compressed air are used. They are pneumatic contactors.

The pneumatic contactor makes used of a magnet valve. This has an operating coil similar to the contactor in Fig. 5, except that the core is movable. When the operating circuit is closed and current flows through the coil, it moves the core by magnetic attraction. This movement opens the air valve and admits air at 70 lb. pressure to the operating cylinder of the contactor. The piston of the air cylinder pushes the contacts together. The 70-lb. air pressure insures that the contacts will be held together very tightly.

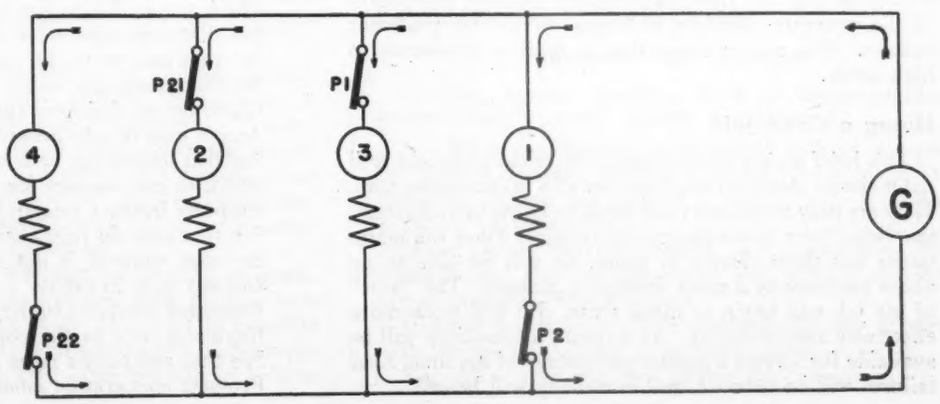


Fig. 8—Diagram showing four motors connected across the generator in parallel as used for operation at the higher speeds

When circuits carrying very low currents must be controlled remotely, a relay is used. This operates in the same way as a magnetic contactor, but its contacts are much lighter in construction. The reason for this is that the relay contacts rarely have to pass more than a few amperes.

Locomotive Circuits

Circuits on a locomotive are of two types,—power circuits and control circuits. The power circuit includes the main generator and traction motors, and the cables and contactors which connect them. When locomotives are equipped with dynamic braking, the resistors are included in the power circuit. Control circuits include lights, excitation system, battery charging circuit, governor control circuits, relay and contactor coil currents, and small motor circuits.

Power circuits may operate over a range from 0 to 900 volts, and may carry up to several thousand amperes of current at times. Control circuits operate at 75 volts and usually carry a few amperes or less. In fact, the total current in all the control circuits on a locomotive rarely exceeds 200 amp.

Let us see now how the electric apparatus on a diesel-electric locomotive is connected. A diagrammatic representation is given in Fig. 6.

The diesel engine is rotating the traction generator and exciter armatures; thus, generating voltage at the exciter commutator. In order to move the locomotive, the engineman merely pulls the throttle from *Idle* position to the first notch. This automatically causes the *S1*, *S21* and *GF* power switches (contactors) to close. With *GF* closed, current from the exciter flows through the main generator field winding to produce a magnetic field. This closing of *S1* and *S21* allows current to flow through traction motors *1* and *3*, and *4* and *2* respectively as indicated by the arrows, causing the motors to turn.

To reverse the direction of motion of the locomotive, the engineman pulls his reverse handle to the *Reverse* position. Then when the throttle is moved from *Idle* to notch *1*, the reversing switch (not shown in Fig. 6) is thrown to the reverse position. The contacts on this switch route the current through the motor fields in the opposite direction, causing the traction motors to change their direction of rotation.

Fig. 7 shows how this circuit would be drawn on a schematic wiring diagram. We see it is a series-parallel circuit in which half of the generator current reaches each motor, and each motor uses half of the generator voltage.

The series-parallel motor connection is used to start the locomotive and train and accelerate to medium speed. The connections are then changed to a parallel circuit as shown in Fig. 8. Here each motor receives one-fourth of the generator current, but uses all of the generator voltage. This motor connection is used to accelerate to high levels.

Doing a Good Job

This brief review of elementary electrical principles will not make an electrical engineer out of a maintenance man. They are only those everyone needs to know to understand the "why" of a diesel-electric locomotive. Once the maintainer has them clearly in mind, he will be able to go about his work in a more intelligent manner. The "how" of his job will begin to make sense. He will work more effectively and efficiently. As a result, locomotives will be available for service a greater percentage of the time, road failures will be reduced, and everybody will benefit.

CONSULTING DEPARTMENT

Where Do Good Foremen Come From?

In your March issue you asked how morale can be made an active factor in the diesel shop. To my way of thinking there is nothing else quite so important as the foreman in building up good morale. Now, what I want to know, is how do we find good men for foremen and how do we train them for the job?

There Is No Perfect Foreman!

How can good foremen be selected when they come in such a variety of sizes and ages? What are the latent abilities, if any, and how can they be developed? After we have found a man possessing those four fundamental qualities of honesty, sincerity, loyalty, and fairness, what other things should we look for and is there an order of importance for these items? This problem is almost universal and it is quite complex. If there was a simple and easy answer, it would have been found long ago. In twenty or more years of trying to pick good foremen, I have not found the answer, but I have collected a few suggestions that might help simplify the problem.

The factors required in a foreman can be most intelligently viewed after analyzing what a foreman is expected to do. These requirements vary so widely between railroad shops that each location should be studied independently. For example, one maintenance group listed twenty items while another listed forty-four items a foreman was expected to do as a part of his daily routine. This last list was divided into two groups,—those items requiring ability to deal with people, and those requiring ability to deal with material things:

Jobs Requiring Ability To Deal With Personnel

Check to see if men are on the job.
See that men start work on time.
See that men work the required number of hours.
See that men's time is not wasted.
Check up on absentees and get reasons.
Assign men to jobs according to ability.
See that orders are understood by men.
Break in men on new kinds of work.
Properly instruct men in how to do work.
See that men do jobs correctly.
See that material is not wasted.
Instruct men in safety.
Represent company to the men.
Represent men to the company.
See that company's rules are enforced.
Promote cooperation among men.

Encourage loyalty.
Stimulate and inspire ambition and progress in working personnel.
Encourage men to do better work.
Commend men for efficient work.
Constructively reprimand men when necessary.
Keep accurate and impartial efficiency record of men.
Cooperate with foremen of other sections and departments.
Be fair and impartial.
Set a good example.

Jobs Requiring Ability To Handle Work and Materials

See foreman on previous shift in reference to jobs.
Find out what work has to be done during shift.
Line up jobs according to urgency.
Plan work systematically.
Estimate time required for jobs.
Plan work ahead for the men.
Have tools and machines ready.
See that material is on hand.
Report unsatisfactory material promptly.
See that rush jobs go out when finished.
Make a study of maintenance records.
Improve equipment performance by better maintenance.
Report unusual conditions promptly.
See that working conditions and equipment are safe.
See that working conditions are orderly and clean.
Suggest improvements in working conditions, equipment and facilities.
Report excess or insufficiency of labor in department or section.
Supply accurate information for all records.

In practice, a large majority of a foreman's time will be spent on those items dealing with people. If a proper job is done in this area, little will need to be done in other areas because groups working together as a team can do much more towards correcting material or equipment problems than an individual foreman can by working alone.

Few items will bring forth more answers or controversy than trying to arrange the requirements of foremen in any order of importance. A clue to the big problem of selecting good foremen may be found in the fact that few people agree on what a foreman should be. Perhaps one of the first steps then is a careful analysis of what you require or expect of your foreman. For example, my requirements for a railroad maintenance shop foreman, employing approximately twenty-five men, would be about as follows, and listed in this order: (1) Honesty; (2) sincerity; (3) fairness; (4) loyalty; (5) dependability; (6) leadership; (7) personality; (8) judgment; (9) initiative; (10) technical ability; (11) perseverance; and (12) ingenuity.

The list emphasizes the importance of abilities in dealing with people as compared with the importance of abilities to deal with machines and equipment. You are not going to always find all of these characteristics in your prospective foreman. Therefore, the second phase of your program is to develop or fill out the deficiencies. This means a foreman training program is an essential part of every maintenance operation.

Early in any foreman's selection or training program, management should carefully evaluate their policies with respect to their supervisory staff. It should be possible for them to set down clearly their philosophy of foremanship. In the past, foremen were often considered only as policemen or the "wielders of the club." This attitude is not in keeping with mproved management practices and, in my opinion, is one of the least necessary elements in good foremanship. I think proper foremanship virtually eliminates the need for policemen or disciplinary action. Whenever disciplinary action is required, it is a direct admission of failure on the part of some foremen to cope with his job. Of course, after acts of insubordination, direct violation of rules, and many others have been perpetrated, disciplinary action must be taken. These deeds occurred after the foreman's failure, and are only the superficial evidence of this previous inadequacy.

It may appear that the foreman's task is an impossible one because no man has been able to lead all mankind to righteousness. Being the perfect foreman is beyond our human grasp, but the desire to be that man is within reach of all. Honestly aspiring to that lofty ideal will do much to encourage foremen to carefully analyze their deficiencies after they have faced a situation requiring corrective measures. The foreman's influence is always present in any employee conduct or morale problem. This participation begins the day the employee starts to work, and ends only after his services have been concluded.

Effective foreman training can be as elaborate or simple as management wishes. In general, the programs must be adjusted to the needs of each railroad. Instruction programs must be laid out with an appreciation of the foreman's ability to absorb. In the main, foremen are practical men, more concerned with the arithmetic of getting specific jobs done than they are with the algebra or theoretical philosophy of supervision. Training programs to be effective should bear a close relationship to the specific job that the foreman has to do. Conference groups under the direction of an able leader are one of the best methods of teaching the elements required. It should be pointed out that a single conference, or group of conferences lasting a few months, will rarely do the job. A foreman's job is complex, and is continually changing. If foremen are to keep pace, they must continually grow and improve in stature and knowledge of their jobs. This means that the foreman training job will never be done.

Many textbooks on foremanship are available, and more are being written. There are numerous volumes on psychology and other related subjects for background or reference material. Therefore, material is not a serious problem. The success or failure of foreman training programs are more often determined by the attitude of the participants than by the subject matter available.

E. S. Lowe.

Diesel-Electric Locomotive Batteries

Questions and Answers

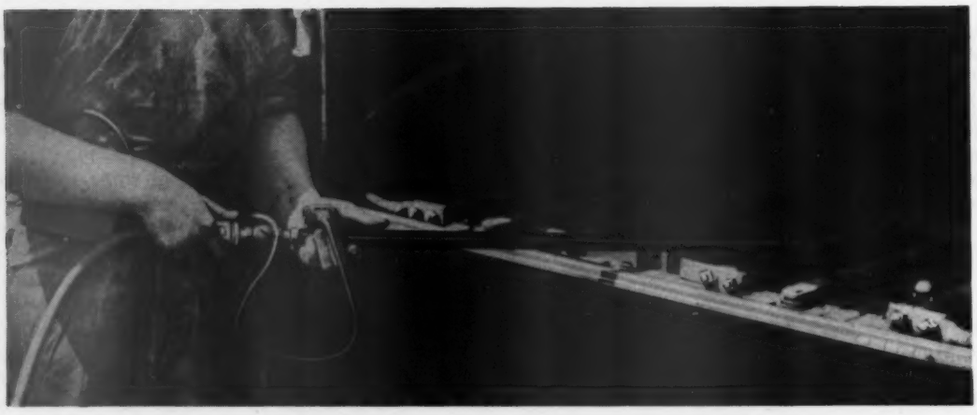
Q.—How can an operating check of voltage regulator performance be made without a voltmeter?

A.—When a locomotive is equipped with an ammeter, the Electric Storage Battery Company recommends the following method for making a rough check on voltage regulator performance:

Make certain that the battery is approximately fully charged and that the generator and voltage regulator are at operating temperature.

Observe the charging rate indicated by the ammeter with the engine running at medium speed.

Stop the engine and shut off the fuel pump.



Adding water to a locomotive starting battery with an automatic cell filler

Roll the engine over two or three times, by use of the battery starter.

Open the fuel pump and start the engine.

Observe the charging rate with the engine running at medium speed.

The charging rate should be higher than before, because the battery was partially discharged by the rolling over and starting of the engine.

After a few minutes of running, the battery should again be fully charged and the charging rate should have decreased to about the same rate observed at the beginning of the test.

If the charging rate does not taper off to approximately the same value, the voltage regulator may have too much frictional lag at the pivots or other points, and it should be adjusted mechanically, the proper setting being made with a voltmeter.

Q.—When and how should water be added to a storage battery?

A.—Only approved or distilled water should be added to the cells at sufficiently frequent intervals to keep the electrolyte level above the tops of the splash covers. When adding water, fill to 1/8 in. below the bottom of the cover filling tubes, and no higher.

Careless addition of water above the high level point results in overflow of electrolyte through the vent plug openings provided for normal gas escape.

An overflow of electrolyte lowers the gravity, reduces battery capacity, rots wood trays and damages the battery compartment. It also causes corrosion and troublesome grounds in the electrical circuits. Eventually, it will necessitate removal of the battery for gravity adjustment and repairs to damaged parts.

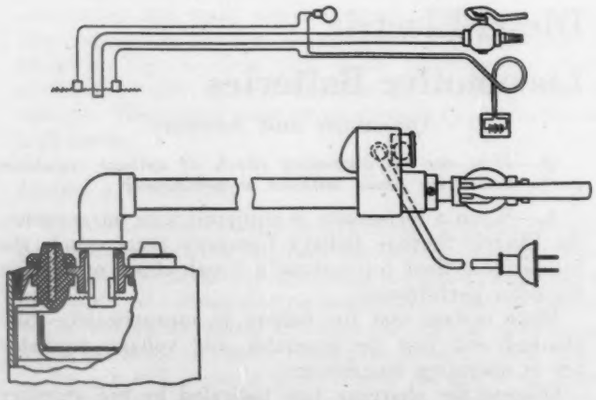


Diagram showing operating principle of Exide automatic cell filler

Proper use of an automatic cell filler, as shown, will eliminate overfilling. The principle and operation of the Excide type cell filler is illustrated in the figure which shows a wiring diagram and outline of the filler with nozzle inserted in the filling tube of a cell. When the electrolyte reaches the proper level, it closes an electric circuit, lighting a warning light. The operator then shuts off the supply of water manually.

The amount of water used is a good indication of whether the battery is receiving the correct amount of charge. As a general rule, a battery in good condition using more than approximately 1/2 in. of water per month, is receiving too much charge. If it uses less than approximately 1/4 in. per month, it is not receiving sufficient charge for a locomotive in daily service all cells should require the same amount of water. If one cell takes more water that the otherr examine it for leakage.

Always take hydrometer readings before adding water.

The time of adding water is important in cold weather. When it is cold, add water just before the locomotive goes into service, so that the charging current will mix the water with the electrolyte. If water is added, and the battery left standing in freezing temperatures, it will freeze. Since water expands when it freezes, it can damage the hard rubber battery container by cracking it.

Only approved or distilled water should be added to batteries. The former is water which has been analyzed periodically and found to be safe for storage battery use. The Electric Storage Battery Company performs this service free of charge when properly identified quart samples are sent to its Allegheny Avenue plant in Philadelphia and transportation charges are prepaid.

If approved water is drawn from a tap, it should be allowed to run a few moments before using. Water should not be transported or stored in any metallic vessel, except one made of lead. Glass, earthenware or rubber receptacles that have not been used for any other purpose are satisfactory.

Nothing but water should be added to a storage battery. Never add special powders, solutions or jellies. A great many special preparations of this sort are injurious, producing a corrosive or rotting action on the battery plates, thus reducing the voltage and capacity of the cells.

S. K. LESSEY
The Electric Storage Battery Company

EDITORIALS

Some Facts About Box Car Floors

Questioned about box-car floor life, first cost, maintenance cost and possible improvements, a responsible car department officer recently said: "We have some box cars which were built in 1948 and 1949 in which wood decking was applied. This decking was 1¾-in. by 5¼-in. tongue and groove, B or better fir, straight grain. The car also had two intermediate Z-bar stringers on each side. We are receiving quite a number of these cars from foreign lines where the decking has been broken in a number of places, no doubt due to extremely heavy trucks having been used while the cars were loaded or unloaded. In my opinion, it is doubtful whether a complete new wooden floor in a box car will last five years."

In this connection, a recent study by *Railway Mechanical and Electrical Engineer* showed an average floor life of four to six years, with installation cost of $150 to $300. The car officer referred to first cost as follows: The average cost of installing a car floor is $225 per car for material and $29.40 for labor. This is for a 40-ft. 6-in. box. These figures are based on new car production, 20 cars per day. The labor on renewing floor in an old car, which includes cost of removing old decking, is about $43 a car. The figures which I am giving you are based on work done in one of our larger shops. The labor charge naturally would be considerably more on an average repair track, due to lack of facilities.

The *Railway Mechanical and Electrical Engineer* study showed an average repair cost for car floors of $20 to $60 per car per year which was decidedly less than this particular car man's estimate of $100 per car per year. His comment regarding the desirability of modern improvements was pointed and unequivocal. "I am definitely convinced that any railroad is justified in installing improved floor materials or designs, because the saving in maintenance on some of the improved floors in a very few years will offset the additional cost."

Making a Test The Most Effective

An interesting departure from the usual practice of testing certain items of repaired car and locomotive equipment by subjecting them to high pressure before return to service can be observed at scattered points along several railroads. The general procedure involved is to substitute, for the short test at high pressure, a prolonged test at medium pressure. Experience has shown that this method has merit in detecting leaks that might otherwise have gone unnoticed.

There has not been enough experience gained or evidence accumulated on the value of prolonged lower-pressure testing to justify recommending the procedure generally. It is likewise early to recommend industry-wide adoption of this method of testing even one specific part, when perhaps only one shop on one road has found it to be superior. But the general idea appears worthy of investigation.

Even where the prolonged low-pressure test gives results only equal to those of the higher pressure test, there remains another possible reason for considering its adoption. That reason is that it is entirely possible that a part which would perform satisfactorily for a normal term of service at normal pressure might fail when subjected to 1¼ or 1½ times working pressure. However, it is readily admitted that this can be countered by an equally logical argument that if a part is not strong enough to stand an above-normal pressure before entering service, it stands a good chance of failing at working pressure after a year or so of service.

Prolonged low-pressure testing, like anything else that offers a chance of reducing failures on the road, should receive attention because of the need and the value of keeping equipment moving, whether that equipment be an expensive diesel locomotive or a humble freight car. If it proves better and more realistic for testing only one part out of every ten the time spent in determining what that one particular part is will have been well worth while.

In the final analysis, the whole question boils down to one in which only experimentation and experience will give the answer.

Save Your Copies

Starting with this issue, the *Railway Mechanical and Electrical Engineer* will publish a series of articles on the maintenance of the electrical equipment on diesel locomotives. A large proportion of all the apparatus on a diesel is electrical. It is also true that a large part of the men in railroad shop service have a mechanical, rather than an electrical background. The articles are written in simple, colorful language which will permit the man with no electrical experience to understand the things he needs to know about a diesel-electric locomotive.

The articles are also written for the electrical man. Although he knows a lot about things electrical, the diesel is a specific problem which differs in many ways from others in the electrical field. By means of these articles,

he can review things that he knows, and became familiar with their application in this particular field. He will also discover that there are many things with which he is not familiar. Even the manufacturers themselves are constantly finding new ways of applying known factors to improve their product.

The articles will give the why, as well as the how, and when the why is known, the how is much easier to understand.

The first article may be something of a hurdle for some of our readers. It explains the function of motors and generators by comparing them with better-known and more easily understood mechanical devices. It shows what happens when an armature coil moves in a magnetic field and it explains the difference between series and parallel connections. If the reader takes time to really understand this article, the rest will be relatively easy.

The second and third articles will deal respectively with the theory and practice of motor suspension bearings, and of roller bearings and gears. The fourth will cover running maintenance of commutators, and they will go on through all phases of diesel electrical maintenance.

If you will keep your copies, you will eventually have a reference book which, we believe, you will find of great value. The series cannot take the place of the diesel locomotive schools, but it will supplement the work they are doing and, we believe, it will fill a need of long standing.

NEW BOOKS

HEATING, VENTILATING AND AIR CONDITIONING GUIDE. *1951 Edition. Published by the American Society of Heating and Ventilating Engineers, 51 Madison avenue, New York 10. 1,456 pages; Fabrikoid binding. Price, $7.50.*

The arrangement of chapters in this 29th edition remains the same as in the preceding edition. They are grouped in sections under the headings Fundamentals, Human Reactions, Heating and Cooling Loads, Combustion and Consumption of Fuels, Systems and Equipment, Special Systems, and Instruments and Codes. The Technical Data Section has 24 additional pages, but an even greater quantity of new material because of the space saved by concentration and condensation of previous technical text. The section has reference material on the design and specification of heating, ventilating and air conditioning systems based on Transactions, the investigations of the Research Laboratory and co-operating institutions, and the practice of the members and friends of the society. A Manufacturers' Catalog Data Section contains essential information concerning modern equipment.

INDUSTRIAL INSTRUMENTATION. *By Donald P. Eckman, College of Engineering, Cornell University. Published by John Wiley & Sons, Inc., 440 Fourth avenue, New York 16. 396 pages, 5½ in. by 8½ in.; cloth bound. Price, $5.*

The principles of measurement methods employed in industrial processing and manufacturing are reviewed in this book which brings theory into line with practice. The method rather than the mechanism receives the primary emphasis. The fundamentals of physics (mechanics, thermodynamics, and electricity) pertaining to the probems of measurement are reviewed (1) to focus attention on the fundamentals of engineering, and (2) to induce a more analytical and less empirical approach to the problems of measurement. Composition analysis instruments and methods are treated in a chapter that covers emission and absorption spectroscopic analysis, mass spectrographic analysis, and other important methods. Methods of applying instrumentation to process are presented with the arrangement and selection of instruments and controllers, process analysis, and supervision of instrument equipment. Also covered are high vacuum instrumentation, and instruments for mechanical measurements, such as displacement gages, strain gages, force meters, velocimeters, and accelerometers. Schematic diagrams of operation principles and meter installations are given, and over 150 problems included.

PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE. *Pubished by the Lincoln Electric Company, Cleveland 1. 1,200 pages, 5½ in. by 8¾ in., illustrated. Price U. S. A. $2; elsewhere, $2.50.*

Incorporated in this Ninth Edition of the Procedure Handbook are new techniques, new electrodes, and much new design information on the uses of arc welding developed since the publication of the Eighth Edition in 1945. The book, completely revised and re-edited, is intended as a reference handbook for the executive, designer, engineer, shop supervisor and welding operator. In its editing consideration was also given to its use as a text in schools and colleges. All helpful information from previous editions has been included, but in a consolidated form. In its eight parts are discussed Arc Welding History Processes, Equipment and Nomenclature; Weldability of Metals; Techniques, Procedures, Speeds and Costs for Welding Mild Steel; Basic Design Data for Welded Construction; Machinery Design with Arc-Welded Construction; Designing of Arc-Welded Structures; Inspection and Testing of Weld Metal and Welding Operators, and Miscellaneous Applications of Arc Welding in Manufacture, Construction and Maintenance.

NEW DEVICES

Horizontal Boring And Milling Machine

The Bullard Company of Bridgeport 2, Conn. has announced a new four-way bed Bullard horizontal boring, milling and drilling machine offered in four-inch and five-inch spindle sizes. Both machines have 24 spindle speeds. On the four-inch machine the range is from 8 to 1,000 r.p.m. and on the five-inch machine the speed range is from 7 to 850 r.p.m.

This machine is designed with a heavy box type, four-way bed to assure a high degree of productive ability with maintenance of accuracy. This bed supports equally on four ways a heavy ribbed box type saddle and table. The ways are covered by stationary sheet metal guards. Replaceable non-metallic bearing surfaces are used under both saddle and table.

The table is of box-type construction, heavily ribbed, longitudinally and transversely. As in the case of the saddle, non-metallic way surfaces are used. The cross feed nuts revolve in pre-loaded anti-friction bearings which are adjustable for wear. The table is clamped to the saddle by two equalizing clamps operated by a single lever at the front end of the table. Table and saddle mechanisms run in oil and the ways are lubricated by the Trabon lubrication system.

The spindle carrier ways are an integral part of the main head casting and gibs are used for wear compensation. The head is supported on 24-in. ways which run to a height of 29 in. The head ways are six inches by three inches and in addition there is a narrow guide 29 in. by 6 in. adjacent to the lead screw. All gears, bearings and shafts are lubricated by filtered oil circulated by two rotary pumps. The filter elements are renewable.

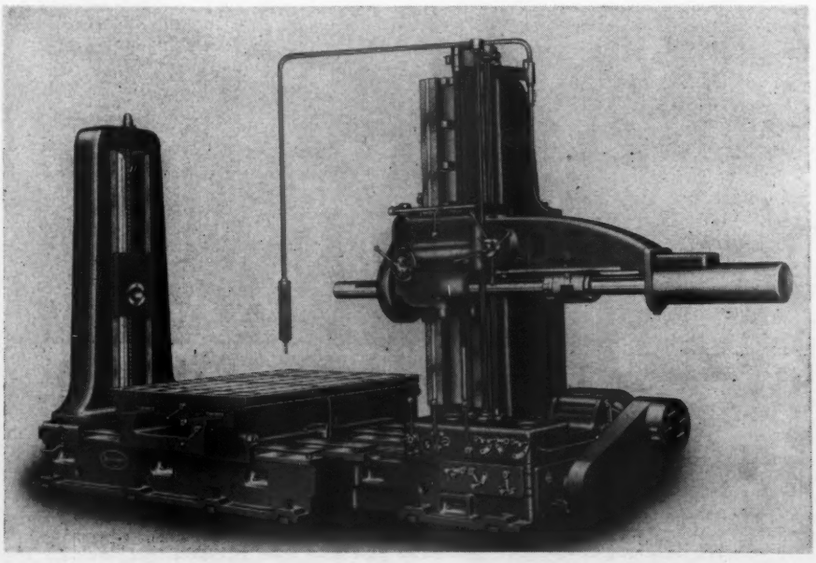
A submerged pump in the large reservoir supplies filtered oil under pressure to all gear contacts and bearings. The spindle sleeve and other head gears and bearings are not operated in an oil bath but are under pressure jet lubrication. In this system, after the oil has been used it is returned to a sump by a second, or scavenging, pump to be refiltered and recirculated by pressure. The use of the system enables the quantity of oil to each point to be controlled and eliminates the generation of heat in the oil by hydraulic churning. Exterior lubrication of all sliding surfaces and bearings is accomplished by the "One-Shot" system.

One of the more important elements in the horizontal boring machine is the spindle sleeve. In this machine the steel bull gear is bolted to the rear of the face-plate flange on the spindle sleeve. By locating the bull gear in this position, a direct drive is provided for large diameter milling cutters without the necessity of transmitting torque through the sleeve. The bull gear is 18 in. in diameter and is in one solid piece weighing 400 lb. This weight, plus the mass of the spindle, gives the flywheel effect desirable with cemented carbide milling cutters. The spindle sleeve bearings are Timken preloaded roller type. Two bearings are used close to the spindle sleeve face plate. The rear bearing of the spindle sleeve is also a Timken bearing. Lubrication is provided by forced feed through several pressure jets between the bearings.

The 29-in. over-all length of the spindle sleeve and the front and rear spindle sleeve bushings are of deep-hardened ball-bearing steel. The gears throughout the spindle drive are the helical type. The speed and feed boxes are assembled as a self-contained unit mounted directly on the bed. The interlocking mechanism provides more than one feed unit such as head, table and saddle, being engaged at the same time. For safety, rapid traverse, available to all units, is in a direction always opposite to that selected for the power feed. There are 24 feeds in inches per revolution of the spindle, for each feed in both fast and slow gear positions of the spindle, making a total of 48 feeds. The feed range is from .0002 to 1.550 inches per revolution.

The speed box is of constant mesh helical gear drive design in conjunction with which sliding internal gear tooth clutches are used rather than sliding gears for changing speeds. The gears run in a pump-circulated oil bath. Push button controls in the pendant station prevent operation of the machine before starting the lubrication pump and a pressure switch automatically stops the machine if the oil pressure drops below the pre-determined setting.

These machines are equipped with a hydro-dynamic coupling and brake motor driving through multiple V-belts. The machine is driven by a 25 h.p. enclosed, fan-cooled, Brake type motor.



Plastic Battery Plate Separator

A new plastic battery separator is announced by The Electric Storage Battery Company, Philadelphia, Pa. Called Pormax, the separator is a polyvinyl chloride synthetic, and is made solely from raw materials found in abundance within the United States.

Separators should be made from highly porous, acid-resistant, and non-oxidizable materials. Port Orford Cedar or Douglas Fir wood is commonly used to make separators for automobile batteries. The higher grade batteries use rubber or glass separators because of their better resistance to electrolyte attack and oxidation. The manufacturer states that the Pormax separator is very porous, non-brittle, and more acid-resistant than either wood or rubber separators and that because of this, it substantially increases battery life.

For the last five years company engineers have been testing and improving the separator. Two years ago, a pilot plant was set up at Stokes Molded Products, Inc., Trenton, N. J., a subsidiary of The Electric Storage Battery Company, to study and develop techniques for mass producing Pormax. Special machinery had to be created for this purpose. When production is expanded, first priority will be given to the armed services. However, as expansion proceeds, Pormax separators will be available for Exide batteries in civilian use.

Air-Drying Protective Coating

A new plastic coating has been developed to protect tanks, tank cars, pipes, fittings, structural steel parts and chemical processing equipment against attack by splash, drip and spray from corrosive chemicals, corrosive atmospheres, weathering and rust. It will be marketed under the name of U. S. Royalguard protective coating.

The plastic compound introduced by the United States Rubber Co., New York 20, combines high film flexibility with good adhesion and impact resistance. It will not chip or crack and can be used on steel, aluminum, concrete, hardwood, or composition board. It is applied by spray, allowing one hour drying time between coats and 24 hours drying time after the final coat. It requires no primer and can be produced in a variety of colors.

A sharp instrument will cut through the film but the break can be repaired easily by touching up with brush or spray. Metal should be grit or sand-blasted before the coating is applied, cement should be etched with hydrochloric acid, while wood and composition board needs rough sanding to assure a good bond.

◆

High-Bay Reflector Lamps

Two high-wattage industrial lamps with built-in reflectors for use in the lighting of high-bay shops have been announced by General Electric's Lamp Department, with headquarters at Nela Park, Cleveland, Ohio.

Because almost no dirt collects on the bottom of the bulbs, the only place where light is emitted, the new lamps are said to be especially desirable for use in places in which dirt collection normally causes severe reductions in light levels. They are seen as especially advantageous in high-bay areas where lamps can be reached for maintenance only at high cost, or interfere with shop operation by tying up a crane.

Produced in both 500- and 750-watt sizes, the lamps employ a new bulb design, the R-52, having a special contour to distribute the light downward for effective use in the working areas, and a cutoff to give reasonably comfortable brightness down to 35 deg. below the horizontal. The lamps measure 6½ in. across the face, and 11¾ in. in length. The base is of the mogul screw, mechanical type, and the lamps are designed to be burned base-up, or within 25 deg. of that position. The bulbs should not be touched by accessory equipment, and should be protected against falling water.

The R-52 lamps give substantially even illumination when the spacing between units is not greater in distance than the mounting height. The amount of light delivered at working levels compares favorably with that provided by industrial luminaires of the focusing type. Downward candlepower, within an 80-deg. cone, averages approximately 4,000 for the 500-watt lamp and 6,000 for the 750-watt size. Much early use of the new lamps is expected in existing fixtures, and especially in those having reflectors which have deteriorated from age, chemical corrosion, or accumulation of dirt and grime. This shielding will serve to protect the lamps from mechanical and water breakage.

◆

Hydraulic Pipe Bender

The model 800 semi-automatic hydraulic bending machine made by the Wallace Supplies Mfg. Co., 1300 Diversey Parkway, Chicago 14, is a compact bending machine 21 in. wide by 34 in. high by 17 in. long, with power well beyond its capacity of 1¼ in. O. D. by No. 16 B.W.G. steel tubing or 2 in by .093 in copper or aluminum tubing with a yield point up to 12,000 p.s.i. The unit is powered by a standard 2-hp. 220/440-volt, 3-phase, 60-cycle motor furnished with the machine.

It is operated by a single lever which when pushed down causes the bending arm to swing around to the degree of bend selected and stay there until the operator has removed the bent part; then the lever ls moved up and the arm swings back to its original position.

The bending die is held on by spring clips for easy changing. This die is a combination die with four defferent sizes, one to each side.

The bender can be changed sinbply and easily from a right-hand to a left-hand bender by changing the pressure and clamping arms over and inserting the bolts into holes ready for that purpose.

It is all welded construction, and the 10 in. steel cylinder to which the top and base is welded to is also the tank containing the hydraulic fluid.

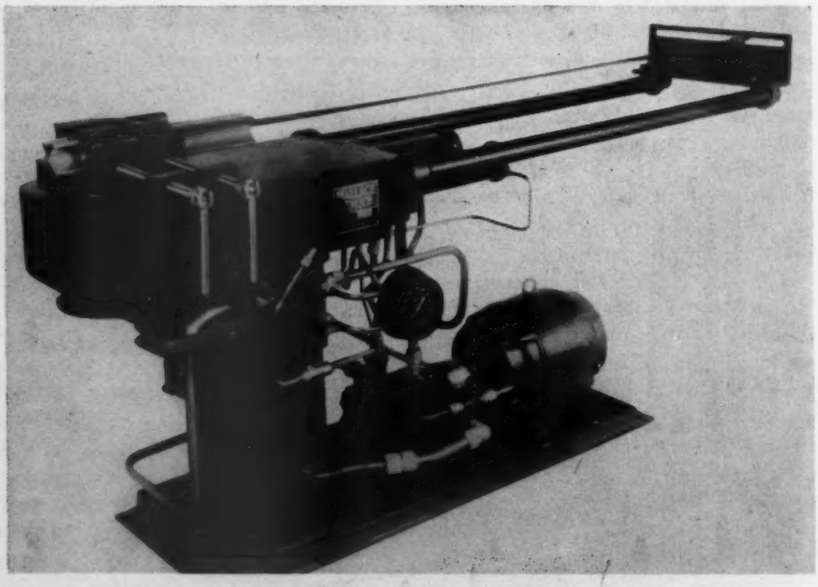
◆

Piston Lift Gravity Drop Hammer

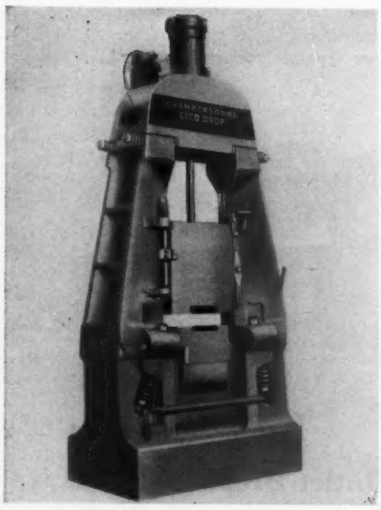
A new model of the Ceco-Drop, a piston-lift, gravity drop hammer has been designed for the production of work requiring short, snappy strokes, permitting faster, more accurate production. Known as the Model C, it was introduced by the Chambersburg Engineering Co., Chambersburg, Pa.

Often, work of this nature makes it necessary to wipe or polish the top die after a certain number of strokes. To provide for this, the device has a safety rest attached to the frame which can be swung into position under the ram when elevated.

Stroke of the unit is controlled by quick positioning dogs mounted on a pivoted rocker which in turn is connected to the operating valve. A shock absorber con-



The Wallace Model 800 hydraulic pipe and tube bending machine



nected to this rocker neutralizes shock and vibration.

Where it is desired to change from long stroke to short stroke or vice-versa, the Ceco-Drop Short Stroke Control may be attached. This is an air operated dog controlled by a push-button on the treadle. Pressure on the button changes the kind of stroke while release of button converts or reverts to the standard stroke.

This unit has a 20 to 1 anvil where the anvil is twenty times the weight of the ram. It is also available in a 15 to 1 ratio where specified.

◆

Lightweight Arc Welders

A series of three Wilson Bumblebee arc welders of 300, 400 and 500 amp. capacity respectively have been introduced. All models have sturdy construction, are compact and lightweight. Features, according to the manufacturer, include instant arc starting, wide current range, easy-to-operate controls and minimum maintenance. The units are available from the Air Reduction Sales Co., Division Air Reduction Co., Inc., New York 17.

Automatic hot-start control with arc stabilizing capacitors are provided on the 300 and 400 amp. models. Current ratings are 60-375 for the 300 amp. unit, 80-400 for the 400 amp. model and 100-675 for the 500 amp. machine.

Incorporated in these units is silicone insulation which increases safety in two ways: it operates safely at high temperatures without breaking down and is water repellent. Also the light weight resulting from the use of silicone insulation makes these models ideal for mounting on running gear for portability. There are no rotating parts, with the exception of the fan on the 400 and 500 amp. models.

◆

Single Spindle Boring, Drilling, Milling Unit

Speeds from 10 to 1,300 r.p.m. in fine increment through 45 changes provide the new single-spindle machine with specific metal working advantages.

This machine tool was designed by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., to meet the urgent production requirements that demand continually faster cutting speeds, heavier cuts, better finishes and greater accuracy.

A 4 in. diameter nitralloy steel spindle having a travel of 30 in. is furnished. Rotating on anti-friction bearings, speeds up to 1,300 r.p.m. are possible. Positive machine settings to close limits are possible with the quick-acting, electrically operated positioning device.

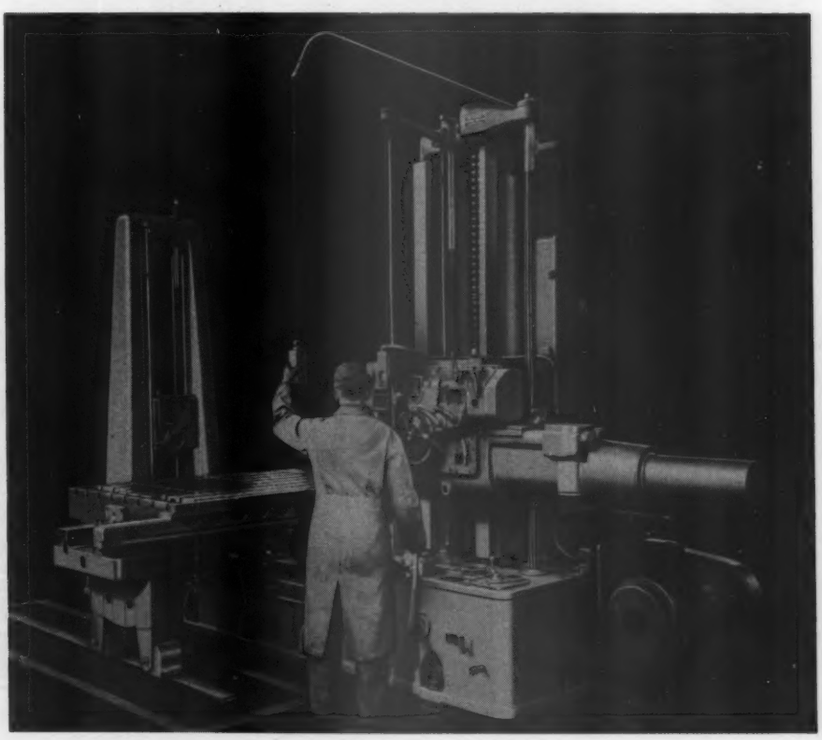
An electric push-button control station having forward-reverse-stop-and-inch buttons is provided in a swiveling pendant. This control box can be swung in a semicircle to any position.

A simplified gear change requires only two hand cranks. The operator may select any of the 45 spindle speeds without the necessity of reading a complicated chart.

◆

Power Saw Protractor

A practical Saw Protractor for use as a guide in power sawing operations has been introduced by The Black & Decker Mfg. Co., Towson 4, Md. By using this unit, the operator may cut practically any angle accurately and easily.



The device is constructed of metal for rigidity, yet it is very light, weighing only 1½ lb. It consists of a straight edge, a segment clearly calibrated in units of 1 deg., and an easily movable holding arm. The desired angle can be set by merely loosening a wing nut on the under side of the holding arm and moving the arm until the indicator points to the correct degree mark. Its wing nut is then retightened to prevent slippage of the holding arm.

The saw protractor is particularly useful for compound mitre cuts when used in conjunction with the bevel adjustment on most power saws. It can also be used for laying out any carpentry work involving angles. Its use is adaptable to practically all portable electric saws.

◆

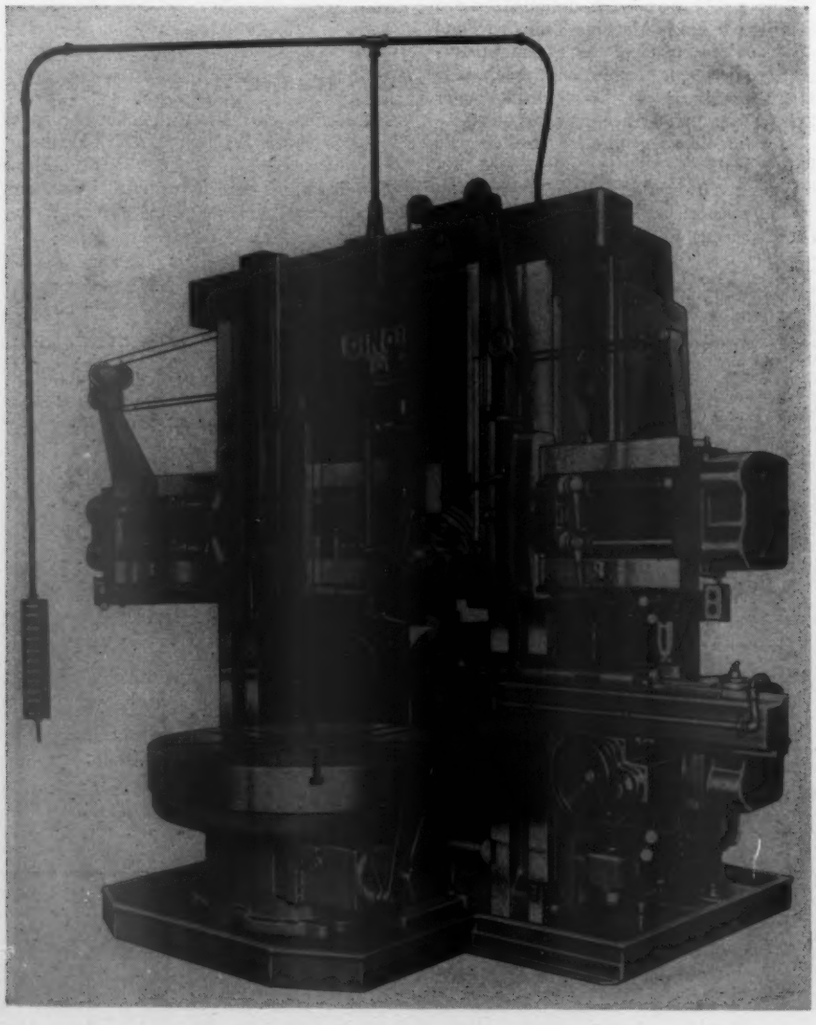
Vertical Boring, Turning Mill

Design improvements have been incorporated in all new Hypro Vertical Boring and Turning Mills by their manufacturer the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. These features include nonmetallic bearings for ram and saddle; independent traverse motors for rail and side-heads; swivel type pendant control; helical rack and pinion on the ram; marked feed controls; anti-friction bearing table transmission; 16 feed gear box; two arrangements of mechanical change gear drives and three electrical arrangements for single shaft drives.

To assure positive power to various machine heads, independent traverse motors are used. They respond instantly for complicated drive shafts and transmission units have been eliminated. The pendant control swivels to any likely work position, enabling operator to watch part being machined with safety.

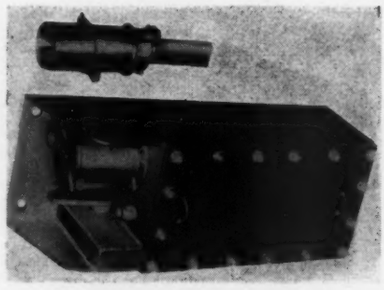
A new feed box provides 16 feeds from 0.003 in. to 0.500 in. on the 54 and 64 in. machines and 0.004 in. to 0.750 in. on the 6-ft. or larger standard and heavy duty mills.

Two arrangements of mechanical change gear drives are available. In the 16-gear change main drive, table speed variation is obtained through 16 mechanical gear changes. Power for this drive is obtained through a 1,400 r.p.m. 40-50 or 60 hp. a.c. motor depending upon needs. A similar drive unit but having 4 gear changes requires a 40 or 50 hp. adjustable 3 to 1 speed d.c. motor for table speed variation. Motor speed is controlled with a rheostat.



With a 3 to 1 heavy-duty adjustable voltage drive, table speeds from 20 to 1 in two separate ranges are possible.

◆



Outlet Breaker For Docks and Piers

Pier outlet breakers, offering a simplified standard method of supplying auxiliary power to ships at any dock or base, are available from Westinghouse Electric Corporation. They can be placed along docks or piers, providing full protection for power cables and convenient disconnects.

The units use Westinghouse type AQB circuit breakers of class HI design, in accordance with Navy Department specification 17B1 (INT.), covering air circuit breakers, electric, for shipboard use. These outlet breakers are available for either 250-volt d.c. or 440-volt a.c., two- or three-pole service, with trip ratings from 70 to 600 amp. If more power is required, the units can be installed in groups.

Power from the breaker is fed to a standard watertight receptacle capable of interrupting its rated load. Receptacles can be supplied for either three- or four-wire service.

The enclosure is made of ¼-in. steel plate, seam-welded to provide watertight construction. Extended enclosure ends prevent fastening hawsers to the unit. The unit is electroplated with cadmium and tin, and then sprayed with aluminum paint for maximum protection against salt air and water.

The enclosure is provided with a Navy-type, heavy-duty indicating light. Heaters inside the unit minimize condensation. A terminal board is provided inside the unit for pilot light and heater connections.

◆

Single Use Molds Reduce Casting Costs

In the production of Meehanite metal machine parts cast by the Croning process, an average of 30 to about 40 per cent of normal machining time can be saved. This process employs thin, shell-like single use molds made of sand bonded with Bakelite phenolic resins. The mixture of sand and resins is applied to the surface of a heated metal pattern, then baked hard to form half of a mold.

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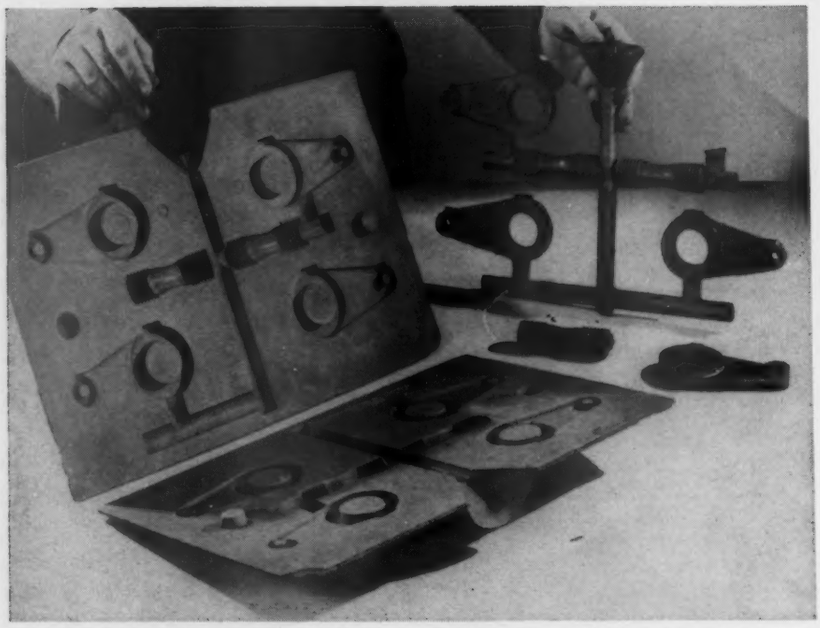


Clamped together, the two halves of a mold shown in the top portion of the illustration, are placed in a flask, surrounded by steel shot or other bedding material and the metal is cast. Smooth surfaces produce castings to tolerances of 0.002 to 0.003 of an in. per in., drastically reducing finishing operations.

A connecting rod, top left and left side of bottom photo, cast by the method was drilled, ground and cleaned in 30 per cent less machining time than is required for a similar crank, right side of bottom photo, cast by ordinary sand mold methods.

Similarly, a crescent guide for threads, top right and bottom right of illustration, on a textile machine required 39 per cent less machining time when cast by the new process.

The use of phenolic resins, product of the Bakelite Co., Division Union Carbide & Carbon Corp., New York 17, is a contributing factor in this economical method of producing more perfect castings.

◆

High-Speed Drum Cleaning Units

Two Rotoblast drum cleaning machines, models ES-400 and ES-382, which simplify and speed-up the removal of dirt, rust, paint and other foreign materials from 30 and 55 gal. returnable steel drums and lids before reuse, are available from the Pangborn Corp., Hagerstown, Md.

Metal abrasive, hurled against both the interior and exterior surfaces of the drum by centrifugal force, scours the metal, leaving no chemicals or alkalies to wash off, and provides a clean bonding surface for repainting.

The model ES-400 is designed to clean 1,000 to 1,100 drums and drum heads a day, while the other unit will clean 320 to 560 drums and covers per day.

In cleaning operations, metallic abrasive is thrown against the surfaces by the vaned wheels, which revolve at 2300 r.p.m. The cleaning cycle takes from 50 to 90 seconds depending upon the nature of the material to be removed, and the facility with which the operator loads and unloads the drums.

Drums are handled differently by the two machines during the cleaning operation. The larger capacity model, ES-400, consists of a table divided by a partition. On either side of the partition are holders for the drums to be cleaned. While one drum is being cleaned in the cabinet, the other is exposed for unloading the cleaned barrel and loading the next drum to be cleaned.

The smaller machine, consists of a cabinet, inside of which are a table and rollers. The operator places a drum on the table, and the drum cover is placed on rollers provided. He closes the door and pushes the starting button. The cleaning proceeds automatically while the operator brings up the next drum for cleaning.

Spent abrasive, mixed with the material it has scoured from the drum, is cleaned of all dirt and broken particles by a separator and returned to the machine for reuse.

◆

Carbon Dioxide Systems Weighing Device

Of utmost importance to guarantee proper operation when a carbon dioxide fire fighting system is activated is the correct weight of charge in the cylinders. To simplify this task, the American-LaFrance-Foamite Corp., Elmira, N. Y., has engineered a weighing device which requires but a minimum of effort.

Without taking the system out of service, the operator is only required to loosen the clamp bolts holding the cylinder, insert a fulcrum under the neck of the valve, press hand lever until the cylinder clears the floor and read the scale for the correct weight.

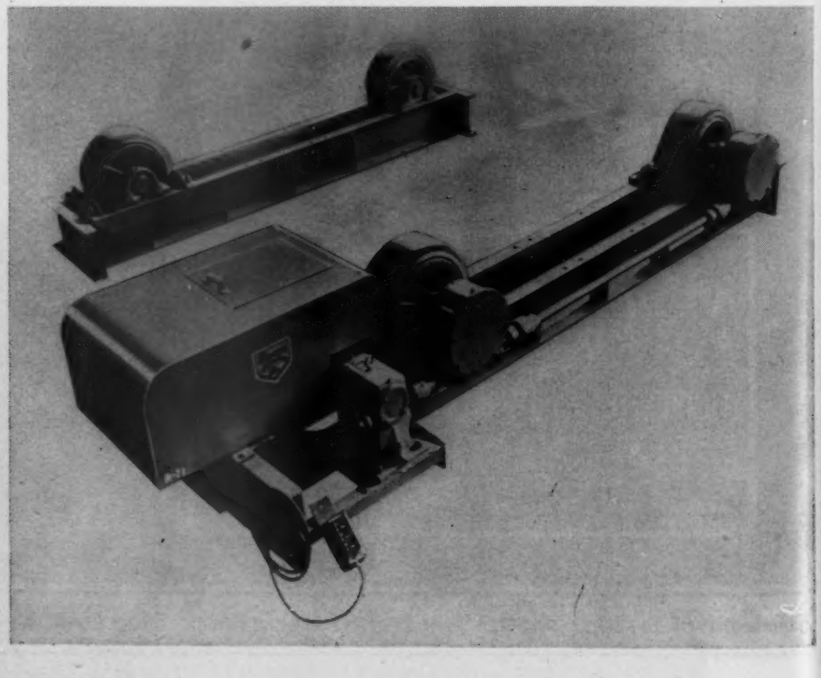
The system is light in weight, weighing only 28 lb. It is constructed of channel iron to give added strength and its scale has a capacity for weighing up to 200 lb.

◆

Motor Driven Turning and Idler Rolls

Since turning rolls are needed to weld large cylindrical vessels, tanks and drums, the Worthington Pump and Machinery Corp., Harrison, N. J., has developed and im-

(*Continued on page 88*)



Piston life in the first General Motors Diesel locomotives averaged 25 to 50 thousand miles. That's been increased through the years beyond 600 thousand miles, due to improved design and materials and better lubrication.

What advances the future will bring are already apparent in the present performance of these locomotives and the way they are helping to meet growing demands upon the railroads today.

GM DIESELS ARE THE BEST RAILROAD SECURITY

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS LOCOMOTIVES LA GRANGE, ILL.

Home of the Diesel Locomotive

In Canada: GENERAL MOTORS DIESEL, LTD., London, Ont.

(*Continued from page 84*)

proved both their motor-driven rolls and idler rolls.

With rubber-tired rollers, the model 75PR has a turning capacity of 75 tons distributed on one power roll and two idler rolls. With steel rollers, its turning capacity is 150 tons distributed on a power roll and five idlers.

Motor-driven rolls are driven through an enclosed variable speed unit, having a range of speeds to meet individual job requirements. The outboard roller unit is adjustable at appropriate center-to-center distances between rollers allowing the handling work of various diameters.

Machines are equipped to meet customers' voltage requirements. A magnetic across-the-line starter is standard with a push-button mounted for remote control operation.

The Worthington model 75IR idler roll is mounted upon a self-aligning pillow block and equipped with a shaft and roller as an integral part. Its fabricated steel rollers can be either plain or rubber-tired.

◆

Battery Water Unit

A new and refillable ion-exchange unit, known as the Filtr-Ion, for delivering water equal in chemical quality to triple-distilled water from an ordinary faucet, has been announced by the La Motte Chemical Products Company, Baltimore 4, Md. Designed for small-quantity uses were more elaborate equipment would be impractical, it provides water of extremely high quality for storage batteries. The tube is 8½ in. long and 1⅝ in. in diameter, made of transparent plastic material, and is filled with Amberlite ion exchange resins. Small holes in the top cap prevent excessive flow through the bed of resins, and deionized water is delivered through a small plastic tube. The tube is not intended to remove bacteria or impurities which are not ionized, the manufacturer asserts. As water passes through the apparatus, however, metallic and other ionic solids are taken out of solution by the mixture of anion and cation exchangers.

Fiberglas filters trap physical impurities. The Amberlites change color when they become exhausted. Initially blue-black, the bed of resin turns light yellow in a gradually descending line as exhaustion progresses. When the yellow band reaches the bottom, the unit is refilled. Refill packages contain sufficient resins for two complete refills, and include new filter elements as well.

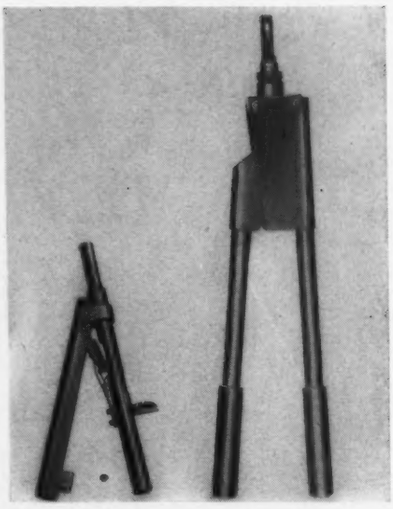
◆

Locomotive Speed Indicators and Recorders

Redesigned models of their line of locomotive speed recorders, speed indicators and engine operations recorders have been introduced by the Barco Mfg. Co., Chicago 40.

Major improvements include built-in-lighting which replaces external bracket type lights and results in more compact overall dimensions of the devices. Introduction of new tooling procedures for the manufacture of the operating mechanism contributes to higher accuracy and interchangeability of parts. No change has been made in the basic mechanical mechanism of these instruments which are offered in two principal speed ranges, 0 to 75 m.p.h. and 10 to 120 m.p.h.

Optional features offered with the Dieselometer unit or diesel locomotive operations recorder, are the recording of dynamic braking and wheel slippage. Prevention of wheel slippage is important in operations because of the usual excessive wear on wheels and the high cost of repairs.

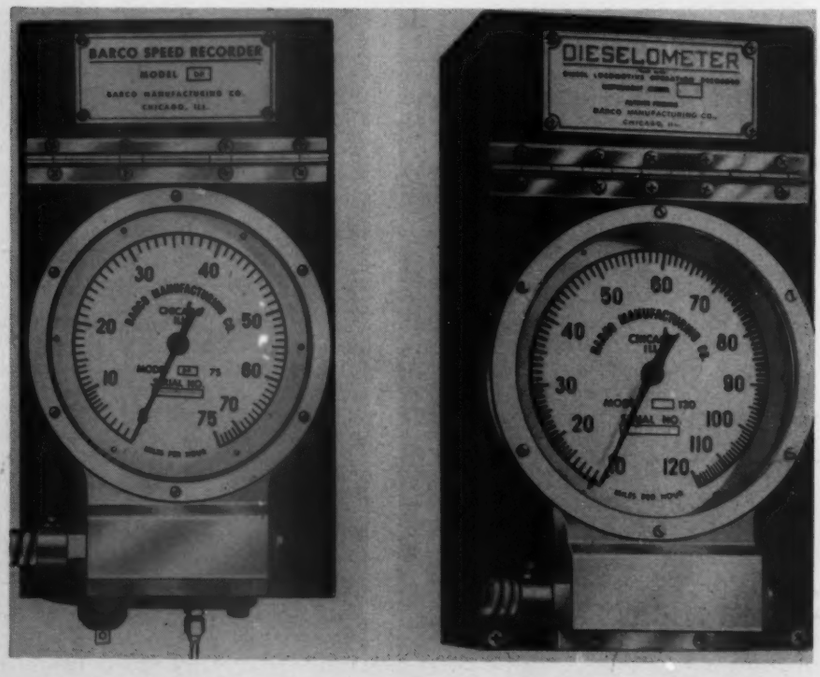


Riveting Hand Guns

In order to increase the utility of their hand guns, several design and construction modifications have been introduced by the Cherry Rivet Co., Los Angeles, Calif.

The new G-11 gun, to the right in the illustration, was redesigned to eliminate undue wear on ratchet teeth caused by accidental release of the draw-bolt. A triangular-shaped trip plate, mounted above the lever pin, now prevents this release unless the handles of the gun are pulled all the way apart.

With the G-36 gun, screw-on type pulling heads are employed which are interchangeable on other models. This standardization increases the capacity of the tools and increases the service life and allows easier operation.



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THE BRUSH GRADE FOR DIESEL-ELECTRIC TRACTION MOTORS

Broken brushes . . . . NO!

Shunt failures . . . . . NO!

Fine commutators . . YES!

plus SUPERB BRUSH LIFE!

● These statements are *facts*. Grade AZY brush is better than any brush ever applied to diesel-electric traction motors as proved by twelve million miles of rugged, on-the-job testing. Never before has there been a grade – GRADE AZY – combining physical strength with long life at high speeds without commutator wear.

This brush has a special, no-fray shunt cable. It has a unique, vise-tight shunt connection.

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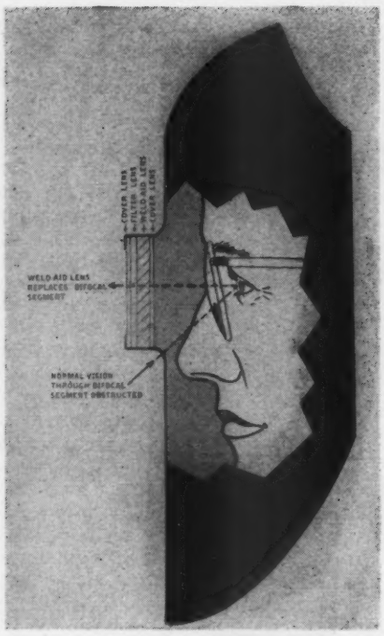


Welder's Optical Lens

An opitcal aid for welders who wear bifocal glasses has been developed. The device, manufactured and marketed by Willson Products, Inc., Reading, Pa., under the trade name Weld-Aid Lens, is designed to help operators who depend on bifocal glasses for near vision. Since the vision slit of the welding helmet is placed for looking straight ahead, it does not permit use of the bifocal segment and welders who wear this type of glasses frequently suffer blurred vision, eyestrain and headaches which seriously reduce their productivity and skill.

This lens corrects the condition by supplying clear near vision over the entire area of the window in the helmet, thus replacing the unusable segment power of the welder's prescription glasses.

The lens consists of high grade optical glass ground to a specific power and mounted securely in a durable plastic frame which fits easily into the average welding helmet. It is available in two sizes, 2 x 4⅛ in. and 2 x 4¼ in. and in five powers: 0.75, 1.00, 1.25, 1.50, and 1.75. To protect the Weld-Aid from front and rear pitting, it is recommended that it be placed between the cover and filter lenses.

◆

Multiple Operation Boring Machine

The Ex-Cell-O Way Type boring machine is a combination unit on which parts can be machined from two directions simultaneously, holding accurate relationship between the operations and minimizing loading and handling time. Essentially, it consists of one, two, three or four standard way units combined with a center section and equipped with tooling to suit.

The unit accommodates two- and three-cylinder in line refrigerator-compressor blocks and four- and six-cylinder V-type engine blocks.

This boring device introduced by the Ex-Cell-O Corp., Detroit, Mich., precision bores cylinders and crankshaft bearings, holding a 90 deg. angle between the bores within 0.001 in. in 14 in. When operations from two directions are performed, the possibility of error in relocating and reclamping the part for each operation is eliminated.

◆

Tool Tray and Oil Strainer

Recently made available by the Beaver Pipe Tools, Inc., Warren, Ohio, are two items that round out their equipment.

Readily mounted beneath Beaver's Model-C power unit by attaching to legs with bolts and wing nuts is the Tool Tray, the first item. This device with a vertical retaining edge makes it possible for workmen to lay tools and equipment in a handy position beneath the machine.

The second item is the aluminum oil strainer which is placed beneath the power unit over a five-gal. pail. Oil and chips drop into the beveled edge strainer. This keeps oil and chips off the ground or floor. strains oil for use over and over again and accumulates chips for easy disposal.

◆

Gas Cutting Machine

A motor driven, straight track-guided unit has been perfected which will supply precision and simplify gas cutting, flame hardening and welding operations. It is claimed by the manufacturer, Air Reduction Sales Co., Division Air Reduction Co., Inc., New York 17, to be useful for billet nicking, slab ripping, skull cutting and in maintenance shops where flame hardening is used extensively. A feature of the device is a traveling carriage which carries the equipment past the work.

Provision has been made for mounting the Airco Plate Edge Preparation Device, the Universal Motorized Torch Arm and Holder Assembly and the Manual Torch Arm and Holder Assembly on the unit named the Radiagraph. Also, automatic welding units which often require a carriage can be mounted on the equipment.

Salient features include all-welded construction; self-contained electric panel; speed ranges from 1 to 72 in. per min. with standard gear reduction unit; and indexed speed control for manual selection of desired speeds.

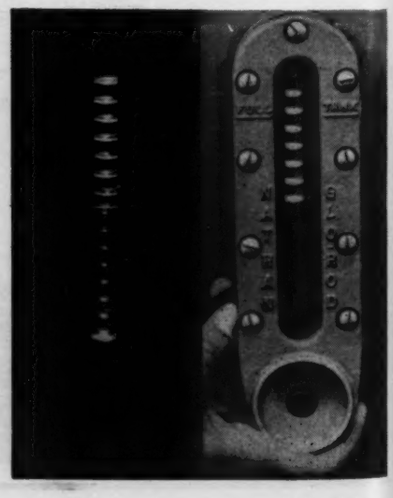
◆

Liquid Level Gauge

The line of Nathan Glo-Rod liquid level gages recently introduced by the Nathan Mfg. Co., New York, adapts an old principle to a new purpose for the increased efficiency of railroad operation. These units use a new version of the principle of light refraction in liquids to provide faster, easier, accurate reading of liquid levels in diesel oil, lubricating oil or cooling water tanks.

They are designed to pipe light from a flashlight or built-in, electric-bulb unit, through a transparent plastic rod which is held vertically in the fluid within the gage body. Shallow holes drilled into the back of this rod appear to the person reading the gage as a series of luminous dots below the level of the liquid, but as elongated horizontal bars above the surface. This makes possible easy noting of the liquid level in the tank.

These gages are recommended for diesel fuel and water tanks up to pressures of 10 lb. per sq. in. and temperatures of 210 deg. F. and for water-alcohol or water-ethylene glycol mixtures. All models are supplied with either a circular target at one end of the gage or a flashlight illumination, or complete with integrated electric bulb ready to plug-in to a standard outlet of 110 volts.



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2. **Safety.** New-beam rigidity (deflection of only .095″ at 32,000 lbs.) is not impaired by repeated brake application. There are no joints to flex and weaken; no separate parts to fall off.

3. **Low Maintenance.** Adjustments are needed only to compensate for brake shoe wear because beam rigidity keeps levers and rods in alignment. Worn surfaces can be quickly restored by welding, and burned heads completely renewed by welding new facings in place.

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Mine Mark of Fine Products

NEWS

Gas Turbine Locomotive Test Data Released

OPERATION of the General Electric Company's gas turbine electric locomotive on the Union Pacific was terminated on March 31. The locomotive had been shipped to the U.P. on July 28, 1949. The first few weeks were spent on a tour, and actual operation in freight service was begun August 22, 1949. From this date to March 31, 1951, the locomotive operated a total of 94,885 miles, produced 344,950 million gross ton-miles of service and burned 1,448,787 gal. of fuel, of which about 95 per cent was bunker C oil. This is an average of 4.2 gal. per m.g.t.m. The average weight of train was 3,356 tons.

Since November 1, 1948, which is the approximate date the locomotive was placed on test in Erie, Pa., the total locomotive miles are 105,732. This includes mileage on the Pennsylvania, the Nickel Plate, and approximately 4,500 miles on the U.P. tour.

Since November 1, 1948, a total of 1,797,426 gal. of fuel oil have been burned, including some power plant testing on the water box when no locomotive mileage was produced. A total of 363,816 m.g.t.m. had been credited to the locomotive from November 1, 1948, until the termination of the U.P. test.

George H. Weiler Joins N.P.A.

GEORGE H. WEILER, who recently retired as manager of the railroad division of the Vanadium Corporation of America, has joined the railroad equipment division of the U. S. Department of Commerce, National Production Authority, Washington, D. C.

Equipment Program For Third Quarter

THE increased third-quarter freightcar program which was announced recently by Administrator James K. Knudson of the Defense Transport Administration was made possible by adjustments in the steel-allocation plan, the allotment of a "little more" steel, and the extension of "direct-assistance" arrangements to the procurement of castings. This was explained later at the Washington, D. C., headquarters of the National Production Authority.

As to the third-quarter car program, Mr. Knudson said he understood it had been stepped up to a 9,500-car monthly basis. Previous information had indicated that the third-quarter allotments of steel and other materials might cut the program to a monthly basis as low as 7,600 cars.

The "little more steel" involved in the larger program was put at 11,000 tons by N.P.A. sources. That would bring the total third-quarter allotment for new-car construction to 683,000 tons. The "adjustments" in the program include some rearrangements of the previously-determined proportions of the different types of steel involved.

As to the third-quarter locomotive program, Mr. Knudson said he understood it had been put on the basis of 275 units per month.

At the request of the Office of International Trade, the N.P.A. has granted the necessary priority assistance to six factories building 160 locomotives for export to 26 countries, The Department of Commerce said the 160 locomotives were at various stages of completion, but shortages of materials had brought production to a halt. Priority assistance was requested because the locomotives are important to "mutual defense."

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of February 1951	Month of February 1950	Two months ended with February 1951	Two months ended with February 1950
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	24,562	21,902	53,438	49,299
3-06	Total, Diesel-electric	18,014	14,696	38,935	29,897
3-07	Total, electric	699	678	1,537	1,443
3-04	Total, locomotive-miles	43,281	37,278	93,916	80,642
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,509	1,249	3,259	2,619
4-06	Empty, total	672	661	1,525	1,455
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	40,438	30,108	89,301	71,093
6-02	Total in oil-burning steam locomotive trains	10,399	10,732	22,126	21,000
6-03	Total in Diesel-electric locomotive trains	49,383	41,038	107,057	82,801
6-04	Total in electric locomotive trains	1,900	1,658	4,175	3,645
6-06	Total in all trains	102,147	83,543	222,693	178,553
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.05	1.04	1.05	1.04
10-02	Loaded freight car-miles	39.10	37.00	38.80	36.10
10-03	Empty freight car-miles	17.40	19.60	18.10	20.00
10-04	Total freight car-miles (excluding caboose)	56.50	56.60	56.90	56.10
10-05	Gross ton-miles (excluding locomotive and tender)	2,645	2,479	2,649	2,458
10-06	Net ton-miles	1,252	1,079	1,248	1,076
12	Net ton-miles per loaded car-mile (M-211)	32.00	29.10	32.20	29.90
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	69.20	65.40	68.10	64.30
14	Averages per train hour (M-211):				
14-01	Train miles	16.40	17.20	16.50	17.20
14-02	Gross ton-miles (excluding locomotive and tender)	42,743	42,103	43,134	41,710
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	42.30	38.30	44.00	38.80
14-02	All	40.30	35.40	42.00	35.90
15	Average net ton-miles per freight car-day (000) (M-240)	894	675	920	689
17	Per cent of home cars of total freight cars on the line (M-240)	34.40	51.90	34.50	51.40

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

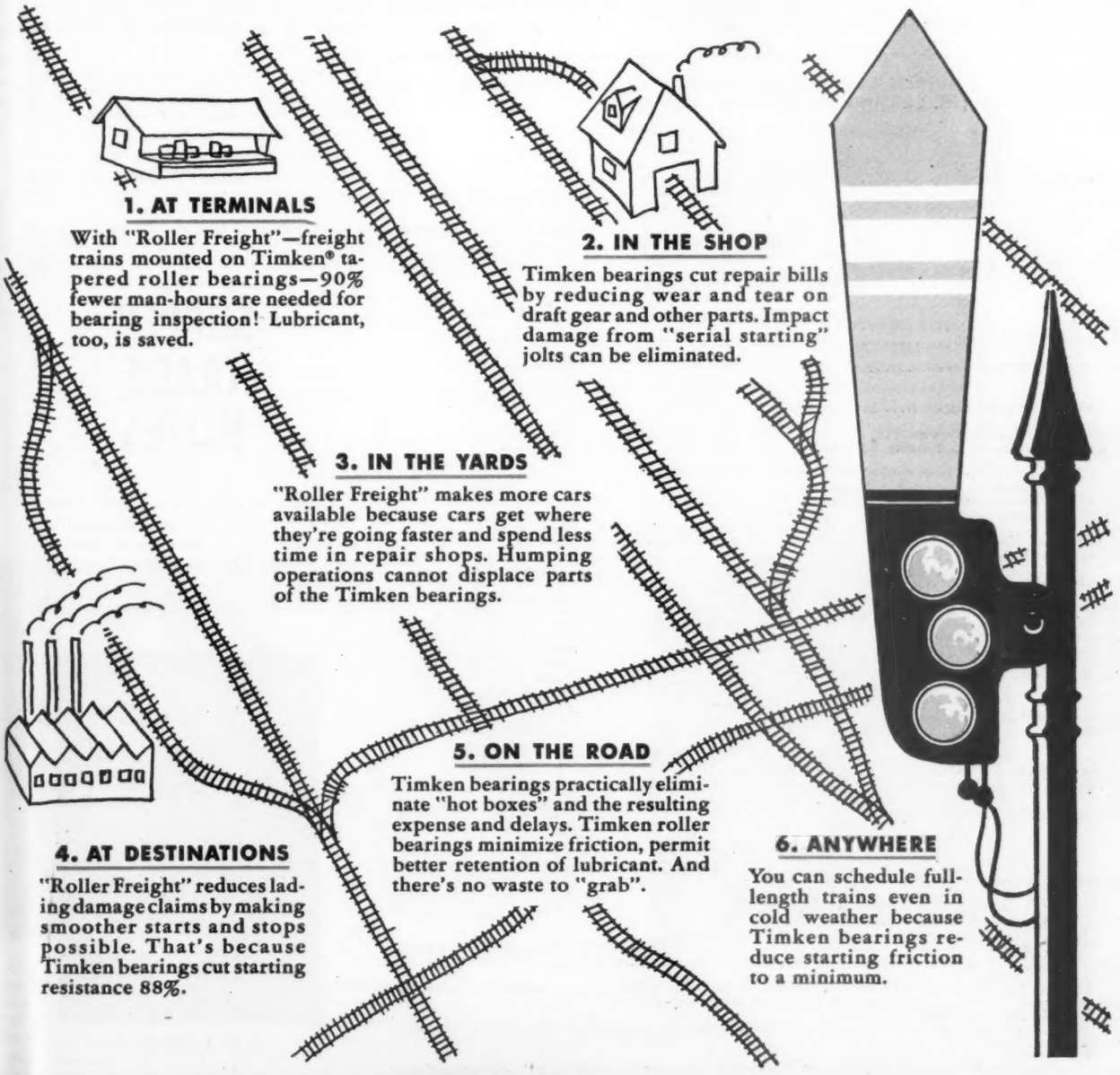
3	Road motive-power miles (000):				
3-05	Steam	10,221	8,956	22,805	21,332
3-06	Diesel-electric	14,009	12,987	30,011	27,108
3-07	Electric	1,429	1,446	3,144	3,108
3-04	Total	25,660	23,389	55,959	51,548
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	242,305	231,368	535,056	500,639
4-09	Total in coal-burning steam locomotive trains	53,625	43,097	121,351	104,900
4-10	Total in oil-burning steam locomotive trains	29,275	32,757	66,841	70,109
4-11	Total in Diesel-electric locomotive trains	144,582	139,574	313,792	291,548
12	Total car-miles per train-miles	9.33	9.57	9.46	9.45

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,238	1,187	2,683	2,610
1-02	Steam, oil-burning	218	209	477	436
1-03	Diesel-electric[1]	2,563	2,102	5,521	4,394
1-06	Total	4,042	3,522	8,734	7,489
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	48	57	106	127
2-02	Steam, oil-burning	12	12	27	26
2-03	Diesel-electric[1]	216	205	462	434
2-06	Total	306	305	660	653
3	Hours per yard locomotive-day:				
3-01	Steam	8.10	6.90	8.30	7.10
3-02	Diesel-electric	17.30	17.30	17.70	17.20
3-05	Serviceable	14.20	13.40	14.60	13.50
3-06	All locomotives (serviceable, unserviceable and stored)	12.30	10.90	12.60	11.00
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.85	1.93	1.85	1.96
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.78	0.82	0.77	0.81

[1] Excludes B and trailing A units.

"Roller Freight" clears the track for lower operating costs—*all along the line!*



1. AT TERMINALS

With "Roller Freight"—freight trains mounted on Timken® tapered roller bearings—90% fewer man-hours are needed for bearing inspection! Lubricant, too, is saved.

2. IN THE SHOP

Timken bearings cut repair bills by reducing wear and tear on draft gear and other parts. Impact damage from "serial starting" jolts can be eliminated.

3. IN THE YARDS

"Roller Freight" makes more cars available because cars get where they're going faster and spend less time in repair shops. Humping operations cannot displace parts of the Timken bearings.

4. AT DESTINATIONS

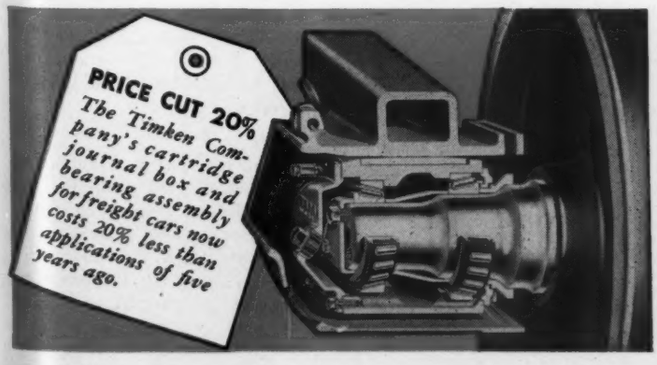
"Roller Freight" reduces lading damage claims by making smoother starts and stops possible. That's because Timken bearings cut starting resistance 88%.

5. ON THE ROAD

Timken bearings practically eliminate "hot boxes" and the resulting expense and delays. Timken roller bearings minimize friction, permit better retention of lubricant. And there's no waste to "grab".

6. ANYWHERE

You can schedule full-length trains even in cold weather because Timken bearings reduce starting friction to a minimum.


PRICE CUT 20%
The Timken Company's cartridge journal box and bearing assembly for freight cars now costs 20% less than applications of five years ago.

MORE BUSINESS, TOO!

Besides cutting operating costs, "Roller Freight" offers you another major advantage. It will give you a big, competitive talking point with shippers in your bid for a greater share of tomorrow's freight tonnage. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN *TAPERED ROLLER BEARINGS*

TRADE-MARK REG. U.S. PAT. OFF.

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION →✳←

Delivery of Used Rails, Axles Restricted by N.P.A.

ORDER M-64, effective May 28, was issued by the National Production Authority to restrict deliveries of used rails and railroad car and locomotive axles. According to an N.P.A. statement, the order was issued "to make available a larger number of used railroad rails and used axles from locomotives and freight and passenger cars for re-use or as scrap."

The statement summarized the order's "three major provisions" as follows:

1. After May 31, no person shall deliver or accept delivery of used rails or used axles of rerolling or scrap grade in an amount exceeding 10 tons of each item in any one month except by written authorization of N.P.A.

2. N.P.A. from time to time will allocate the supply of used rails and axles and specifically authorize quantities that may be delivered for particular uses.

3. Applications for authorizations must be filed with N.P.A. by the owners of materials. The application should state the quantity of used rails or used axles involved, the grade, contemplated party or parties to the transaction, and the location of the material.

Issuance of the order was "necessary," N.P.A. said, "because the rerolling rail mills, the rerolling axle industry, and the foundry and forging industries are increasing their demands for used rails and axles while inventories are dropping to a critical point."

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JUNE ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horsepower*	*Service*	*Builder*
Atlantic & Danville	1[1]	1,600	Road-switch	Alco-G. E.
Detroit, Toledo & Ironton	2[2]	1,500	Road-switch	Electro-Motive
Georgia	2	1,200	Switch	Electro-Motive
Pennsylvania	24	1,250	Passenger	Electro-Motive
	10	1,500	Switching	Electro-Motive
	54	1,500	Freight	Electro-Motive
	42	1,600	Freight	Baldwin-Lima-Hamilton
	20	1,200	Switching	Baldwin-Lima-Hamilton
	18	1,600	Freight	Alco-G. E.
	40	1,600	Switching	Alco-G. E.
	10	1,600	Switching	Fairbanks, Morse
Rutland	6[3]	1,000	Freight	Alco-G. E.
St. Louis-San Francisco	27[4]	1,500	Gen. purpose	Electro-Motive
	10[4]	1,200	Yard switch	Electro-Motive
St. Louis Southwestern	6'A'[5]	1,500	Freight	Electro-Motive
	6'B'[5]	1,500	Freight	Electro-Motive
	4	1,200	Switching	Electro-Motive
Spokane, Portland & Seattle	3[6]	1,200	Switching	Electro-Motive
	2[6]	1,600	Road switch	Alco-G. E.
Tennessee, Alabama & Georgia	3[7]	1,500	Road switch	Electro-Motive
Transportation Corps, U. S. Army	41	800	Switching	Electro-Motive

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type*	*Builder*
Burlington Refrigerator Express Co.	200[8]	50-ton refrigerator	Company shops
Chicago, Indianapolis & Louisville	1	Caboose	Thrall Car
Erie	2[9]	168-ton depressed center flat	Company shops
Grand Trunk Western	125[10]	70-ton covered hopper	American Car & Fdry.
Delaware & Hudson	500	50-ton box	Pullman-Standard
	500	50-ton hopper	Pullman-Standard
Illinois Central	50	Pulpwood	Company shops
	100	Caboose	Company shops
Missouri-Illinois	100[11]	70-ton covered hopper	Mo. Pac. shops
Norfolk & Western	100	70-ton covered hopper	Greenville Steel Car
Pittsburgh & West Virginia	5[12]	Caboose	Internat'l Ry. Car & Equip.
St. Louis-San Francisco	200[13]	70-ton gondola	Pullman-Standard
St. Louis-Southwestern	75	50-ton box	General American
Southern Pacific	1,600	50-ton box	Pullman-Standard
	2,500	50-ton box	Company shops
	900	50-ton gondola	Company shops
Spokane, Portland & Seattle	500[14]	Box	Northern Pacific shops
Wabash	300[15]	50-ton box	Company shops

FREIGHT-CAR INQUIRIES

Spokane, Portland & Seattle	500	50-ton box
Tennessee Central	200	50-ton hopper
	150	70-ton hopper
Transportation Corps, U. S. Army	750[17]	100-ton flat
	250[17]	80-ton flat

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type*	*Builder*
Canadian National	58	Baggage	National Steel Car

[1] Delivery expected in July. Estimated cost, $150,000
[2] Delivery expected in October.
[3] Approximate cost, $675,000.
[4] Receipt of these units and of others currently on order but undelivered will permit complete dieselization, probably early in 1950, of the entire system, including the Alabama, Tennessee & Northern and the Quanah, Acme & Pacific.
[5] Eight of the freight units scheduled for delivery in November and four in December. Two switching units scheduled for November delivery and two for December delivery.
[6] For delivery in September and October.
[7] Approximate cost, $425,700. Two units have already been placed in service. The third is scheduled for delivery in July.
[8] For delivery during the first quarter of 1952.
[9] To be equipped with two four-wheel trucks at each end, with supporting span bolster, for transporting electric transformers.
[10] Approximate cost, $900,000.
[11] Delivery scheduled for September.
[12] Delivery tentatively scheduled for August. Approximate cost, $55,000.
[13] Delivery scheduled for the third quarter of 1952. Approximate cost, $1,275,000.
[14] Delivery expected to begin in September, 1952. Estimated cost, $3,000,000.
[15] For construction next year.
[16] Cost, $4,360,000. The cars will be 73½ ft. long, 10 ft. wide, and 13½ ft. high from the rail.
[17] One hundred of the 100-ton and 100 of the 80-ton cars for passenger service.

Chesapeake & Ohio.—The C&O's recent order for 107 diesel-electric locomotive units (June issue, page 92), was placed entirely with the Electro-Motive Division of General Motors Corporation. No portion of the order was placed with General Motors Diesel, Ltd.

Great Northern.—The Board of directors has authorized the purchase of 1,000 box, 700 ore, 300 ballast hopper, 50 express refrigerator cars, and 15 cabooses.

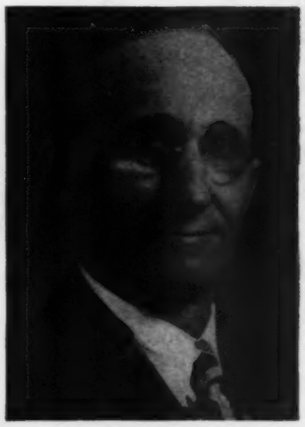
Northern Pacific.—The Northern Pacific will purchase 23 diesel-electric locomotive units for 1952 delivery. Included will be seven 1,200-hp. switching, four 1,500-hp. road-switching, one 1,500-hp. "B" freight and three 1,500-hp. passenger (two "A" and one "B") units, and two 4-unit 6,000-hp. freight locomotives.

Texas & Pacific.—The Texas & Pacific has authorized purchase of 20 diesel-electric locomotive units, including six 1,500-hp.

Union Tank Car Company.—This company's 1952 carbuilding program calls for construction of at least 600 50-ton tank cars (I.C.C. class 105-A-300-W) in its own shops. Cars of this type currently on order at the company's Whiting, Ind., and Philadelphia shops total 1,300, all scheduled for construction this year, contingent only upon receipt of necessary steel.

SUPPLY TRADE NOTES

GENERAL STEEL CASTINGS CORPORATION—*Harry E. Thiele* former vice-president—manufacturing of the General Steel Castings Corporation, has been elected vice-president with duties to be assigned by the president *Luther A. Kleber*, heretofore



H. E. Thiele

assistant vice-president — manufacturing, succeeds Mr. Thiele; and *J. Ellis Turner*, former manager of industrial relations, has been elected vice-president in charge of industrial relations.

◆

BULLARD COMPANY.—At a recent meeting of the board of directors of the Bullard Company *E. P. Bullard* resigned as chairman. The board unanimously voted to name him chairman emeritus. *E. P. Bullard III*, who has been vice-president in charge of manufacturing for the past 10 years, has resigned.

◆

WESTINGHOUSE ELECTRIC CORPORATION.—*S. C. Palmer*, formerly assistant manager

SPOT TROUBLE BEFORE IT HITS WITH HANDY G-E INSTRUMENTS

Road, signal, station, shop and other railroad electrical equipment can be tested simply and easily with General Electric instruments like these. Your G-E representative will be glad to show you how G-E test instruments can help cut costs by locating possible trouble sources. Call him today, or write to General Electric Company, Schenectady 5, N. Y.

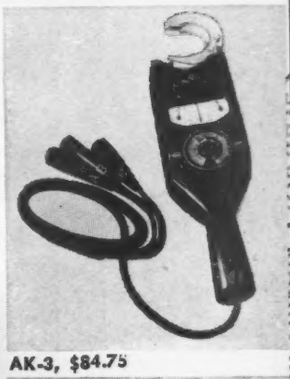
Shop Motors and Controls • Shop Testing Equipment • Under-car Power Plants • Lighting Systems • Electric Heaters • Signal Power Systems • Power-Distribution Systems • Electric and Diesel-Electric Locomotives

You can put your confidence in—

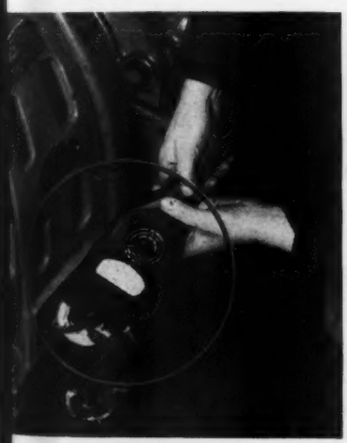
GENERAL ELECTRIC

152-19

New Type AK-3 power-factor meter, shown in use above with close-up at right, measures power factor directly without interrupting service. **Type AK-2 wattmeter,** left, below, being used to check a motor, with close-up next to it, measures a-c power quickly and easily—is ideal for trouble-shooting power surveys. **Type AK-1 volt-ammeter,** shown below, is used to make sure proper current is supplied to motors, transformers, etc.



AK-3, $84.75

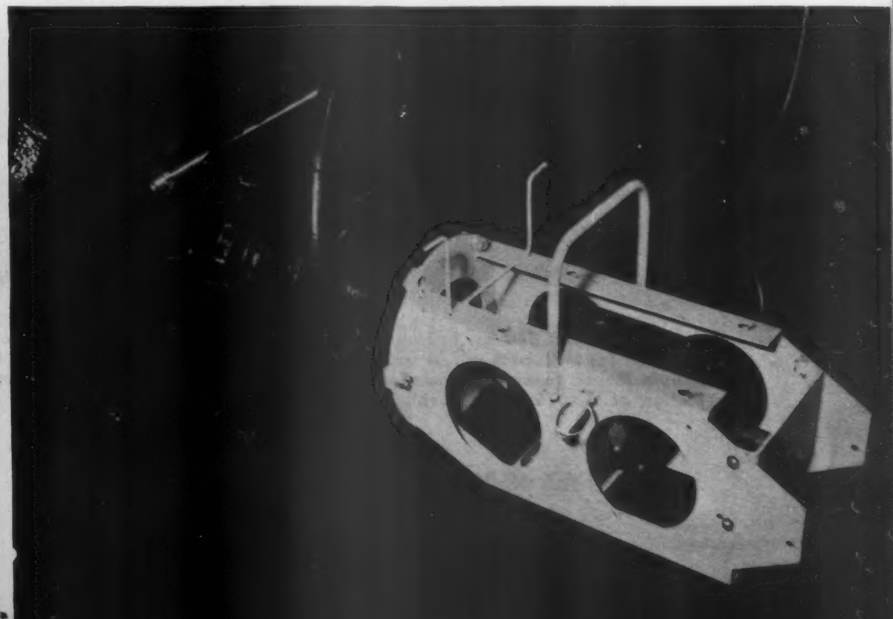


AK-2, $84.75

AK-1, $74.75

Speed-sensitive devices on Alco-GE road locomotives can be tested with equipment that consists of a *new* portable axle-generator drive unit and a portable tachometer-frequency indicator. The latter is shown below hooked up to the equipment to be tested, located in the cab.

Here is the axle-generator drive unit which, together with the tachometer-frequency indicator, is designed to speed up locomotive maintenance operations by aiding in the accurate setting of automatic-transition and over-speed relays, and checks the accuracy of speedometers and the sequence of contactors and speed-sensitive relays. The equipment can be operated by one man.



of the transportation sales department of the Westinghouse Electric Corporation, has been appointed manager of the department, succeeding *J. A. Schoch*, who has been appointed consulitng engineer for the transportation and generator division.

Mr. Palmer joined Westinghouse in 1931 as a member of the graduate student course and, in July, 1934, was assigned to sales duties in the Boston office. In 1946 he was appointed consulting engineer for the transportation division in the New England district and, earlier this year, was appointed assistant manager of the transportation department at East Pittsburgh.

◆

BUDD COMPANY.—*Henry F. Blankenbiller*, formerly in charge of railway disc brake sales for the Budd Company, has been appointed manager of the railway

Henry F. Blankenbiller

service department, to succeed *Clyde C. Elms*, who has retired. *Robert G. Stacy*, formerly assistant sales manager of the railway disc brake sales department, succeeds Mr. Blankenbiller as head of railway disc brake sales.

Mr. Blankenbiller joined Budd in 1940 in the automotive wheel sales department, at Detroit, and was placed in charge of railway disc brake sales in 1941.

Mr. Stacy joined Budd in 1936 and first worked in the blueprint department of the

Robert G. Stacy

product engineering division. He was one of a group who did research and development work on the disc brake. He was subsequently appointed assistant sales manager of the railway disc brake sales department.

◆

MORTON MANUFACTURING COMPANY.—*Robert S. Morton* has been appointed assistant sales manager of the railway division, Morton Manufacturing Company with headquarters at the company's general offices in Chicago.

◆

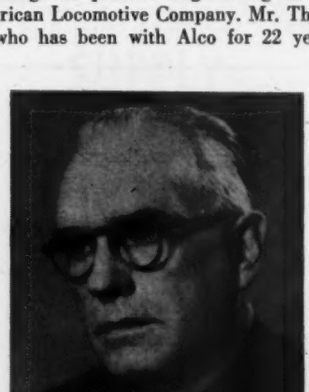
BINKS MANUFACTURING COMPANY.—The Binks Manufacturing Company has established a new office at 22-01 41st avenue, Long Island City 1, N. Y. *E. Cremer* has been appointed sales engineer and manager of the new office.

◆

DEARBORN CHEMICAL COMPANY—*L. C. Henley*, formerly car foreman on the Illinois Central, has joined the railroad department service staff of the Dearborn Chemical Company, replacing *J. W. Day*, who has been called to duty with the armed forces. Mr. Henley will service railroad cleaner accounts in the eastern division.

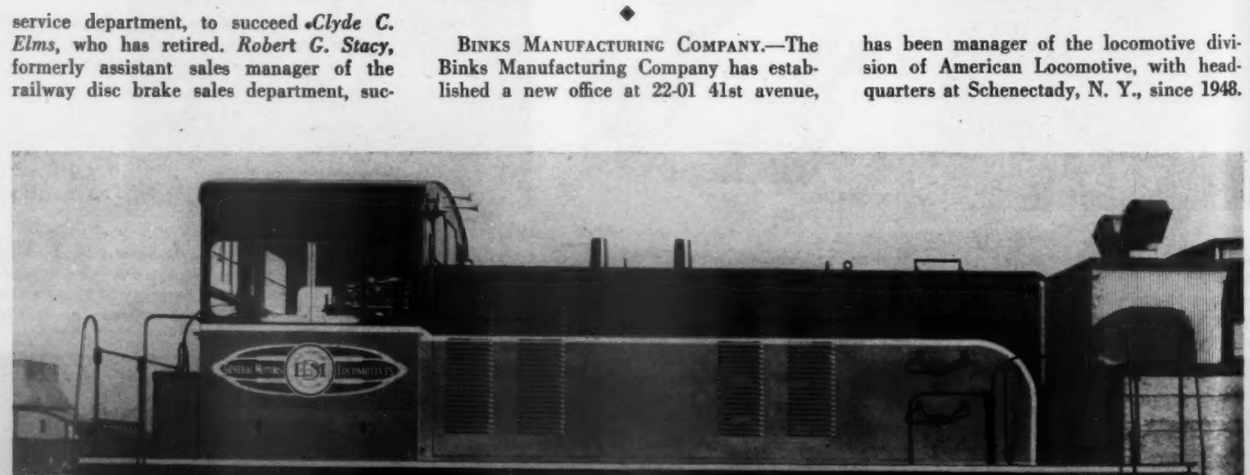
◆

AMERICAN LOCOMOTIVE COMPANY.—*John Thomas* has been appointed vice-president in charge of product engineering of the American Locomotive Company. Mr. Thomas, who has been with Alco for 22 years,

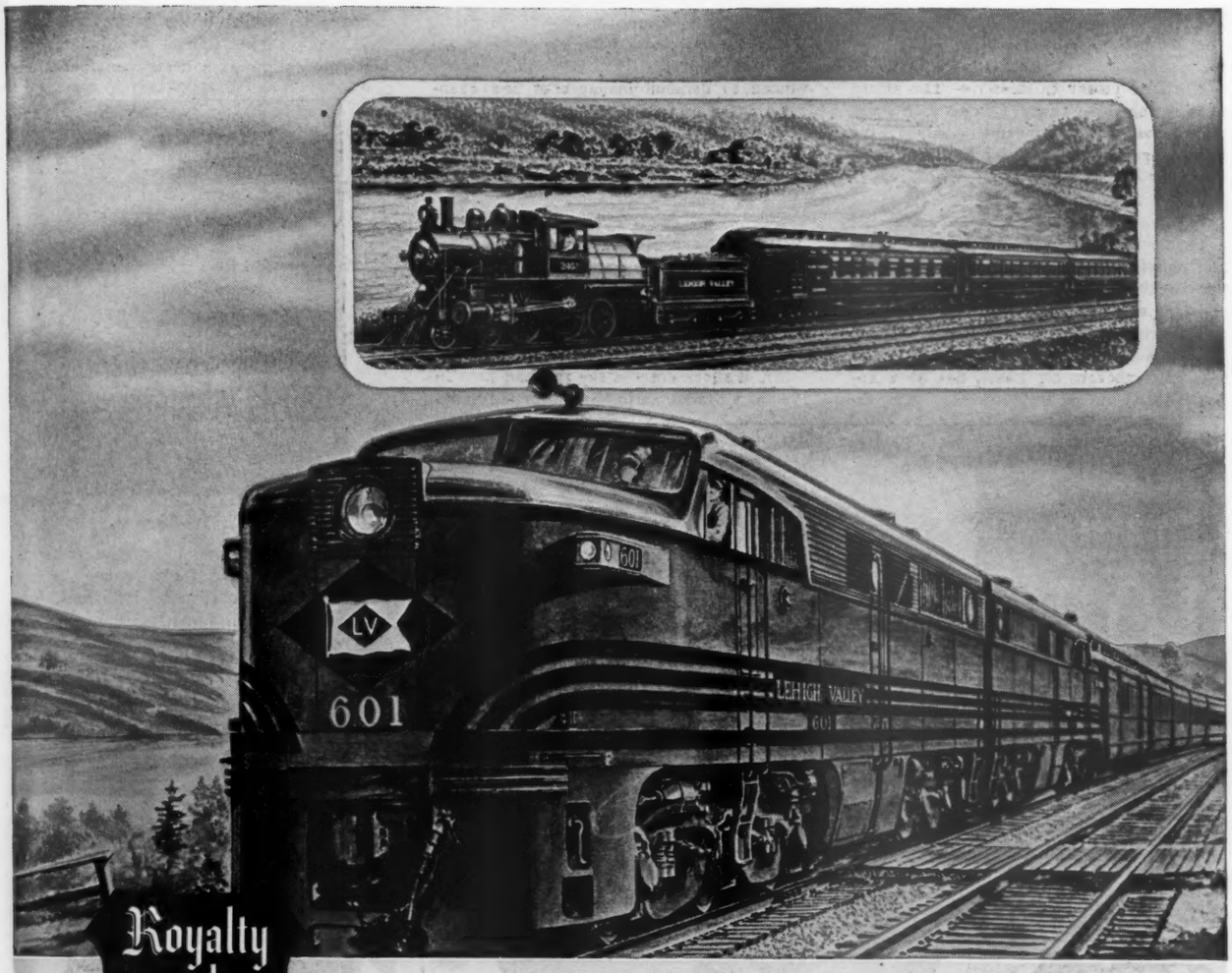


John Thomas

has been manager of the locomotive division of American Locomotive, with headquarters at Schenectady, N. Y., since 1948.



An experimental 340-hp. hydraulic switching locomotive built by the Electro-Motive Division of General Motors. The locomotive, intended for industrial use, is not yet ready for production. It is powered by two G. M. model 6-71 diesel engines equipped with Allison torque converter transmissions. It was announced for the first time on June 14 at ceremonies commemorating the completion of the 10,000th G. M. diesel locomotive unit.



Royalty on the Rails

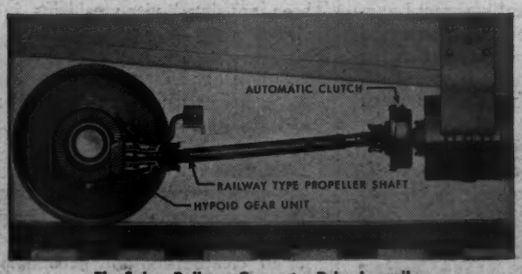
The Lehigh Valley "Black Diamond Express"

Spicer Generator-Drive Equipped

On May 18, 1896, The Black Diamond Express made its first run between the sea and the Great Lakes. People liked this new train, the beautiful scenery through which it ran, the dining service equal to that of first class hotels, and the courteous and efficient train crew.

Now in its fifty-third year, The Black Diamond still makes its daily run between New York City and Buffalo, but what changes in equipment and facilities have occurred during its history! Equipped with new Diesel locomotives, air-conditioned coaches and parlor car, including a glass-enclosed observation lounge car, and a dining service still one of the finest on any railroad, this famous train continues to offer travelers the utmost in comfort and luxury. The heavy demands for electrical current are met amply by the efficiency of Spicer Railway Generator Drives.

An imposing list of America's crack trains and streamliners rely upon Spicer equipment for electrical service of the highest efficiency. Write for literature giving complete details of the Spicer Railway Generator Drive.



The Spicer Railway Generator Drive is easily adaptable to old and new equipment

47 YEARS OF Spicer SERVICE

The Spicer Railway Generator Drive is manufactured, sold and serviced by

SPICER MANUFACTURING
Division of Dana Corporation
TOLEDO 1, OHIO

Prior to that, he was manager of the company's Auburn, N. Y., plant.

◆

JOHN N. THORP COMPANY.— The offices of the John N. Thorp Company, distributors of railway and marine supplies, have been moved from 50 Church street, New York, to 78 Middagh street, Brooklyn 2, N. Y.

◆

TEXAS COMPANY.—*J. G. Wallace,* formerly division manager for the Texas Company at San Francisco, has been appointed assistant manager, railway traffic and sales department with headquarters at New York. *Walter E. Wilcox,* formerly assistant division manager at St. Louis, has been appointed division manager, railway sales division, at San Francisco.

Mr. Wallace joined the company as lubricating engineer in 1924 and was advanced to division manager at San Francisco in April, 1933.

Mr. Wilcox joined Texas in November, 1933, as lubrication engineer, and was appointed assistant division manager at St. Louis in February, 1945.

◆

HUNT-SPILLER MANUFACTURING CORPORATION.—*John C. Wallace* has been appointed chief engineer for the newly created diesel locomotive parts research and development division of the Hunt-Spiller Manufacturing Corporation, Boston, Mass.

Mr. Wallace entered the railroad field in 1946 as a draftsman in the equipment maintenance department of the Bessemer & Lake Erie, and in 1948 joined the Lima-Hamilton Corporation as a design engineer. He

J. C. Wallace

was engaged in diesel locomotive application surveys before his appointment as engineering representative in 1950 and, following the Baldwin, Lima-Hamilton merger, was transferred to Eddystone, Pa., as special projects development engineer.

F. I. Fickett

Franklin I. Fickett has been appointed railroad sales engineer in Indiana, Ohio and Michigan for the Hunt-Spiller Manufacturing Corporation, Boston. Mr. Fickett was formerly with Fairbanks, Morse & Co.

◆

KOPPERS COMPANY.—*Walter P. Arnold,* executive assistant to H. R. Condon, vice-president and general manager of the wood preserving division of the Koppers Company, and *Frank H. Fischer,* assistant general manager of the division, in charge of activities in eastern United States, have been appointed vice-presidents in the division.

◆

FAIRBANKS, MORSE & CO.—*Charles A. Mapp* has been appointed district manager of locomotive sales in the Chicago area for Fairbanks, Morse & Co.

◆

WESTINGHOUSE AIR BRAKE COMPANY.— The Westinghouse Air Brake Company has established sales facilities in Canada for its air compressors and pneumatic control equipment. The *Canadian Westinghouse Company,* Hamilton, Ont., will handle the

(*Continued on page 102*)

In the LONG RUN...
Truarc Retaining Rings
Resilient Stop Plates Prevent Axle Scoring
Easily Replaceable Unit Wick Set
Patented and Patents Pending
IT COSTS LESS TO LUBRICATE WITH MODERN
FELPAX Lubricators
Here's Why...
Maintenance reduced to a minimum of periodic checking and filling the oil sump.
Special Felt Wicks last thousands of miles without attention and eliminate waste grabs.
New, improved Construction simplifies replacing worn out wicks. Inexpensive replacement kits make reconditioning of lubricators a fast, simple operation.
ON "HOT-SHOT" or "LOCAL"—you can be sure every journal is getting full continuous lubrication when modern FELPAX Lubricators are in each axle cap. Waste grabs and starved bearings due to improper packing of old fashioned yarn are eliminated. Special Felt Wicks in constant contact with the journal provide full, continuous lubrication from the first turn of the axle.
For Full Information about Modern FELPAX Lubricators see your locomotive builder or write to:
MILLER FELPAX CORPORATION
WINONA, MINNESOTA
MILLER FELPAX LUBRICATOR

the mountain the Clinchfield

handles huge coal tonnages and fast, Florida perishable freight.

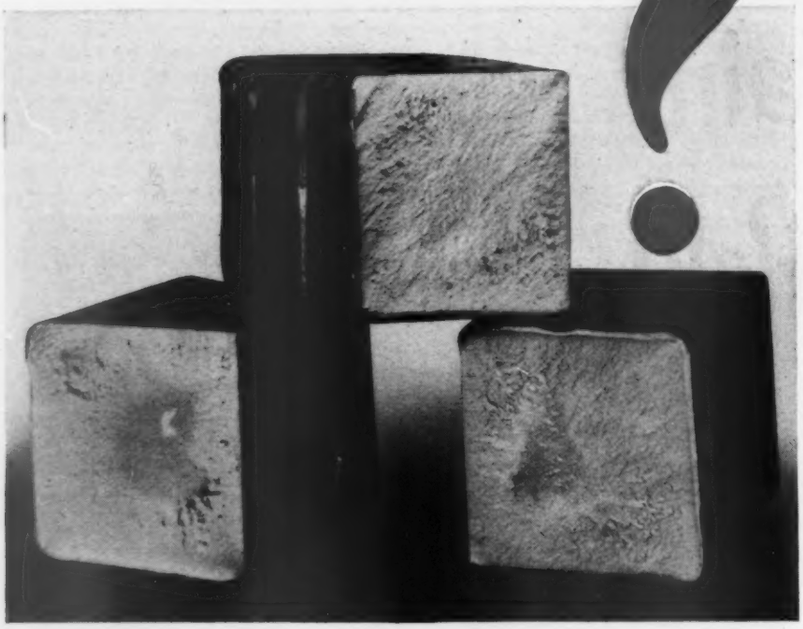
Despite difficult road conditions, the Clinchfield maintains fast, on-time schedules with powerful Diesels, which are lubricated with Sinclair GASCON® Oils.

America's top railroads have discovered that, when road, weather, or hauling conditions are tough, Sinclair GASCON Oils keep Diesels running cleanly, smoothly, and dependably. Are you taking advantage of these fine lubricating oils for *your* Diesels?

SINCLAIR RAILWAY LUBRICANTS

Sinclair Refining Company • Railway Sales • New York, Chicago, St. Louis, Houston

DO YOU KNOW THE ADVANTAGES OF *SHEARING* BILLETS OVER NICKING AND BREAKING?



- **High cutting speeds**
- **Clean, square cuts**
- **Uniform, sheared pieces**

alloy steel billet cut by a "Buffalo" Billet Shear, showing the clean, square cuts produced. There is no "smearing" of the metal, or "notches" on one edge, as in nicking and breaking. "Pipes" in the billet could be easily detected. Sheared pieces are kept to uniform weight, and there is no expense for gas and burner. Best of all, these pieces are cut at the rate of *10 per minute!* "Buffalo" Billet Shears are built in sizes to handle up to 10-inch rounds and 9-inch squares. HUNDREDS are in use! WRITE FOR BULLETIN 3295-A, for facts on lower cost shearing of billets.

BUFFALO "Buffalo" FORGE COMPANY
174 Mortimer St. Buffalo, New York
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

(*Continued from page 98*)

Westinghouse line of industrial air compressors and pneumatic controls for oil rigs, marine vessels and general industrial applications. Complete coverage for sales and service will be provided through district offices in Halifax, N. S.; Moncton, N. B.; Montreal, Que.; Toronto, Swastika and Ft. William, Ont.; Winnipeg, Man.; Regina, Sask.; Edmonton and Calgary, Alta.; and Vancouver, B. C.

◆

PERCY H. WALLER has opened offices at 122 South Michigan avenue, Chicago, and will represent the American Manganese Steel division of *American Brake Shoe Company*, offering railroads and carbuilders a new line of specially designed railway truck, brake and running gear specialties known under the trade name Mangosteel.

Mr. Waller was formerly associated with the Pullman Company for 37 years in various divisions, more recently as assistant chief engineer and assistant to the chief maintenance officer.

◆

BENDIX AVIATION CORPORATION.—*Leonard O. Mjolsnes*, assistant chief engineer of the diesel equipment section of the *Scintilla Magneto division* of Bendix Aviation

Leonard O. Mjolsnes

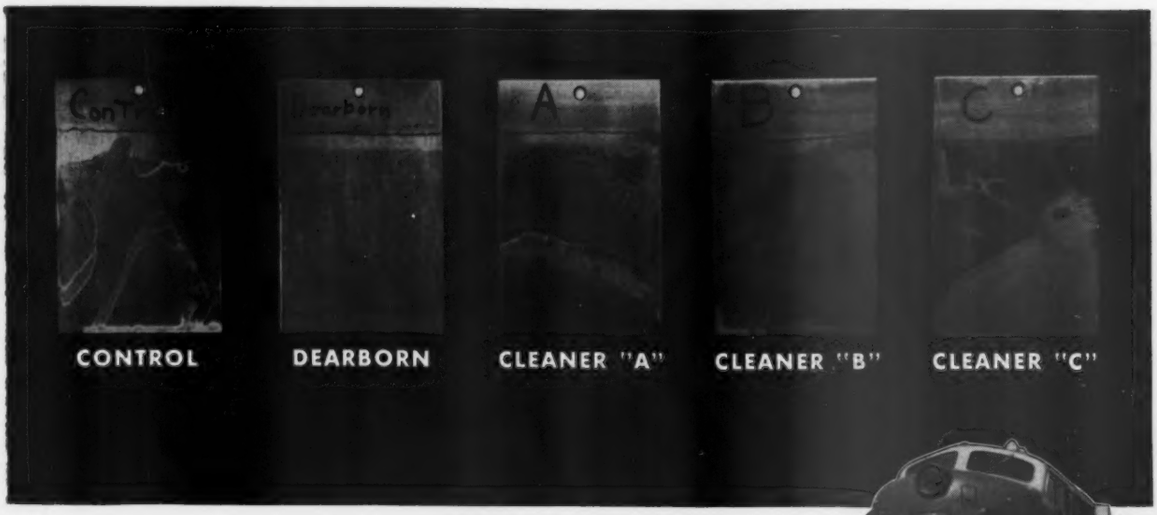
Corporation, Sidney, N. Y., has been appointed chief engineer of the section, succeeding *A. T. Bremser*, deceased.

Mr. Mjolsnes, a graduate of the University of Minnesota in 1935 with a B. S. degree in mechanical engineering, worked for the Baldwin Locomotive Works at Philadelphia, and for the Detroit Diesel Engine division of General Motors Corporation before he joined Scintilla in July, 1947.

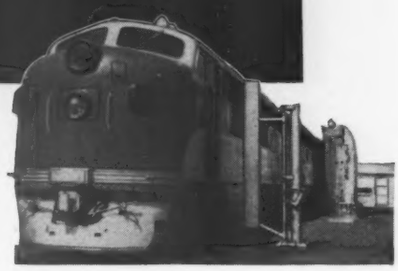
◆

KEARNEY & TRECKER CORP.—*Ralph W. Burk*, vice president of sales for the Kearney & Trecker Corp. since 1943, has been elected vice president for manufacturing. Mr. Burk will continue also as head of the company's sales division.

Mr. Burk joined Kearney & Trecker in 1927 after 10 years with a Philadelphia dealer for the company. He also served as Detroit branch office manager, assistant division sales manager, and general sales manager prior to his election in 1943 to the sales vice-presidency. Mr. Burk is a director of Amtea Corporation, an affiliate



COMPETITIVE TESTS



demonstrate the non-streaking, sheen-producing properties of Dearborn railroad cleaners

These unretouched laboratory test panels conclusively demonstrate the superiority of Dearborn cleaners. A Dearborn Engineer will produce similar results with your equipment . . . and at savings in cleaner cost and man-hours that will be a pleasant surprise.

■ EXTERIOR CLEANERS
Specialized products containing non-streaking and sheen-producing agents formulated to keep painted and lacquered surfaces and polished metal surfaces sparkling new.

■ INTERIOR CLEANERS
Detergent and solvent type materials for interior cleaning of Diesel locomotives, passenger and baggage cars, roundhouses, offices. Designed for safety and economy.

■ ORGANIC SOLVENT TYPE CLEANERS
Compounded for cold cleaning of Diesel parts and filters at terminals lacking heating facilities. Also recommended for cleaning Diesel trucks, Diesel locomotive interiors, traction motor gears, steam locomotive running gear and other parts where excessive oil and grease are present.

■ HOT TANK CLEANERS
For use on steam locomotive side rods, wheels and other parts that become heavily coated with grease and dirt. Also long life materials for cleaning air filters, oil and sintered bronze filters and specialized formulas for non-ferrous metals.

■ ELECTRICAL PARTS CLEANERS
A special solvent of low toxicity for spray cleaning of electrical cabinet interiors, relays, motor windings, other electrical equipment. Removes tarnish and oily film. Will not harm insulation.

■ SCALE REMOVER CLEANERS
For removing scale from Diesel cooling systems with acid pump. While this formula is designed for removing scale from ferrous metals, it may be safely used for cleaning units constructed of copper, bronze, brass or the alloys of these metals.

✓ CORROSION-FREE
Clean with safety. Dearborn cleaners remove surface grime and dirt films without danger of subsequent corrosion.

✓ ECONOMICAL
Lower cleaner cost plus increased coverage per pound results in substantial, traceable savings. Ask for comparative facts.

✓ EASY TO SELECT
The Dearborn line of cleaners has been streamlined to reduce time devoted to ordering, conserve space needed for stocking.

✓ EASY TO USE
Fewer man-hours are needed to clean equipment with Dearborn free-rinsing railroad cleaners.

WRITE. A Dearborn Engineer is ready to discuss your cleaning requirements. Write for complete information on how to "Clean with SAFETY" with the complete, versatile line of Dearborn Railroad Cleaners.

Please note our new address

DEARBORN CHEMICAL COMPANY
Merchandise Mart Plaza • Chicago 54, Illinois

Dearborn
TRADE MARK REGISTERED
THE LEADER IN WATER TREATMENT AND RUST PREVENTIVES

Dearborn Chemical Company
Merchandise Mart Plaza, Dept. RM
Chicago 54, Ill.

☐ Send complete information on Dearborn Cleaners

☐ Have a Dearborn Engineer call

Name.....

Railroad.....

Address.....

City ..... *State*.....

CLEAN
Diesel-Electric Motors
Without Solvents

NO Drying Periods, NO Toxic Hazards with NEW Pangborn AC-4 Blast Machine

The new, fast, safe and inexpensive way to clean motors and generators is with a Pangborn AC-4 Blast Machine. Soft, 20-mesh corncob grits whisk away grease, oil, paint flakes, etc., in scouring armatures, frames, coils and other parts. (See photo above.)

There's no danger from caustic action, no time lost waiting for work to dry. Corncob blast machines operate on standard 40-lb. air supply. Cost of materials averages 90% less and cleaning is done in one-third the time it takes to clean with solvents.

FOR FULL INFORMATION write today and tell us what you clean. Address: PANGBORN CORP., 3700 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

Pangborn
BLAST CLEANS CHEAPER
with the right equipment for every job

for sales of Kearney & Trecker machine tools in South America, and has served on several committees of the National Machine Tool Builders' Association since 1943.

◆

GUSTIN-BACON MANUFACTURING COMPANY.—*E. N. Sleight* has been elected vice-president in charge of the Chicago office.

E. N. Sleight

Mr. Sleight joined the company in 1937 in Kansas City as a sales trainee in the railroad sales department. He was transferred to the Chicago office in September, 1937, and was appointed division manager in January, 1943. As vice-president, Mr. Sleight will continue sales management of the Chicago office.

WATSON-STILLMAN COMPANY.—*Albert B. Diss*, assistant to the executive vice-president of the Watson-Stillman Company since he joined the firm in November 1950, has been appointed manager of manufacturing operations, and will head all activities in the manufacturing, production, purchasing and sub-contracting departments.

◆

GRAYBAR ELECTRIC COMPANY.—The Graybar Electric Company has a new Eastern district headquarters in a three-story, block square building, located at Bridge Plaza North and 21st street, Long Island City, N. Y. The move was from 180 Varick street, New York.

◆

GENERAL ELECTRIC COMPANY.—*Philip H. Hatch* has become associated with the Transportation Divisions of the General Electric Company at Schenectady, N. Y. A picture and a sketch of Mr. Hatch's career appeared on page 114 of the June issue at the time of his retirement as general mechanical superintendent of the New York, New Haven & Hartford.

◆

IRON & STEEL PRODUCTS, INC. Chicago, has announced the following appointments: *James J. Collins*, general manager of Iron & Steel Products, Inc., has been appointed vice-president and general manager; *Edward J. Sagert*, assistant to executive vice-president, has been appointed vice-presi-

IDEAL

For Faster, Smoother Tube Rolling

IDEAL MASTER Tube Expanders

designed to withstand severe strains of power production —for the manufacture and repair of LOCOMOTIVE and other FIRE TUBE BOILERS.

No. 54

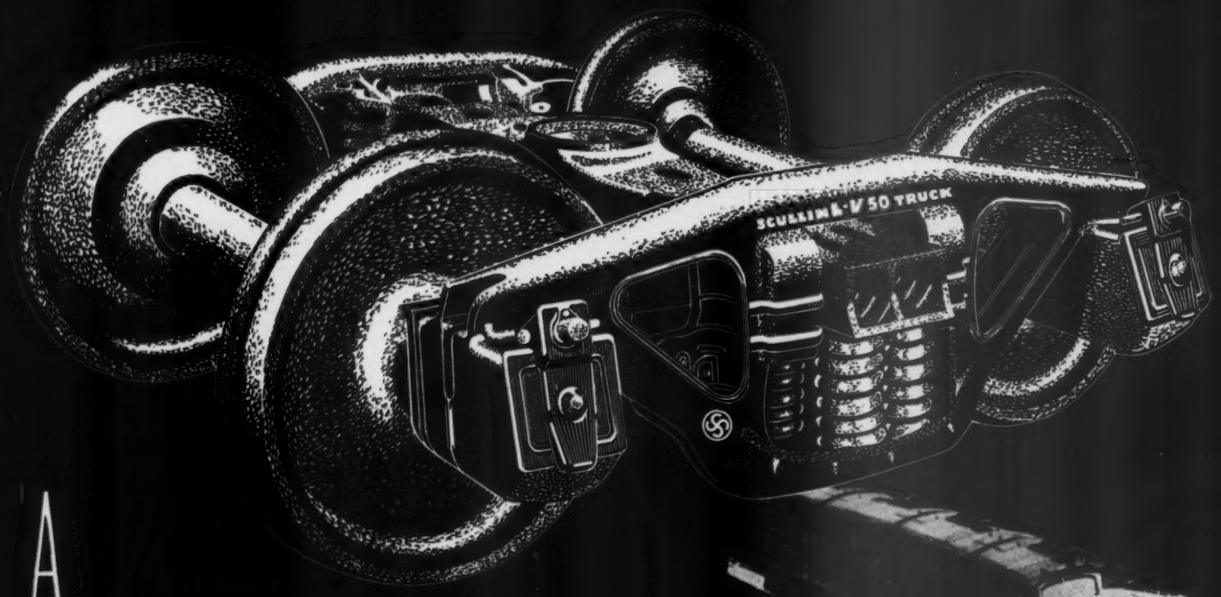
No. 54-S . . . for rolling tubes in the FIRE BOX end. Has rolls 1¼" long. Expander will automatically draw tubes out against guard uniformly ¼" for beading.

No. 54-L . . . for rolling tubes in the SMOKE BOX END . . . has rolls 1⅞" long, for heavy sheets and where tubes project various distances beyond sheet.

Similar Ideal Tube Expander (No. 60) made for rolling and flaring tubes in one operation.

See Your Dealer, or Write Us Today!

THE GUSTAV WIEDEKE COMPANY
DAYTON 1, OHIO



Any freight car is a more profitable car on

SCULLIN L 50 V TRUCKS

LATERAL VERTICAL
CUSHIONED MOTION

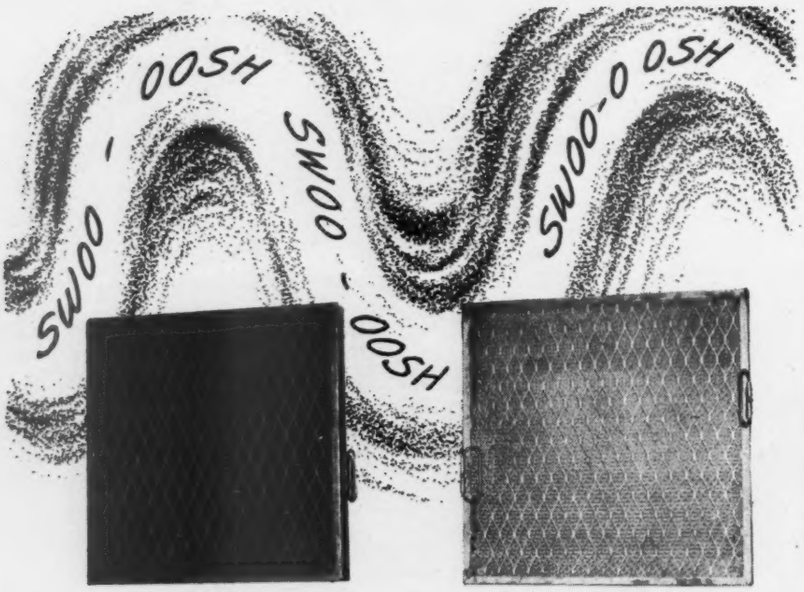
THE SMOOTHEST TRAFFIC-BUILDERS BETWEEN LCL AND YOUR RAILS

STEEL CASTINGS MANUFACTURER

NEW YORK
CHICAGO
BALTIMORE
RICHMOND, VA.

SCULLIN STEEL CO.

SAINT LOUIS 10, MISSOURI



BEFORE AFTER

Clean and Oil Your Air Filters with the Part Time of One Unskilled Workman!

When you use the Magnus Filter Cleaning and Oiling Method, you handle filters in batches. 18 large filters (20"x 22"x 2¼") or 36 small filters (9"x 20"x 2¼") are "swooshed" clean at one time by the vigorous action of the cleaning solution through all areas of the filters, as they are moved up and down 54 times a minute in the Magnus Aja-Dip Cleaning Machine. It takes about 2 minutes to clean out all dirt and clogging deposits.

It takes just one minute to water-rinse each batch in a Magnus Aja-Dip Rinsing Machine. A one-minute dip in a Magnus Hot Oil Tank, followed by final drying in a Magnus Dryer, gives you a batch of cleaned, oiled filters . . . ready for use.

With these five processing machines, your entire filter cleaning, oiling and drying operation can be carried on by one unskilled worker in only a part of his time. At the same time you get much better cleaned filters, more uniformly oiled, than you can possibly get with sprays, steam guns or geyser type equipment.

If you want to cut your filter cleaning and oiling costs— ask for complete information on the Magnus Method.

Railroad Division

MAGNUS CHEMICAL COMPANY • 77 South Ave., Garwood, N. J.

In Canada—Magnus Chemicals, Ltd., Montreal

Magnus CLEANERS AND CLEANING EQUIPMENT

Representatives in all principal cities

dent; *William J. Parker II*, superintendent, has been appointed general superintendent; and *Warren C. Stevens*, general foreman, has been appointed superintendent.

◆

EX-CELL-O CORPORATION.—*Donald H. McIver* has been elected vice-president in charge of industrial sales.

◆

VAPOR HEATING CORPORATION.—*G. C. Scott*, service manager of the Vapor Heating Corporation, has been appointed service

G. C. Scott

R. J. Armbrust

assistant to the vice-president in charge of sales, and *R. J. Armbrust* succeeds Mr. Scott as service manager. Mr. Armbrust has been associated with Vapor in a service capacity for nine years.

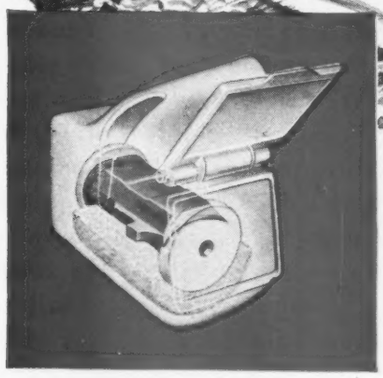
◆

BUDA COMPANY—*Carl G. Meyer*, who has been appointed district representative for the Buda Company, handling sales of Buda fork lift trucks, industrial tractors, "Chore Boys," and lifting jacks to distributors and railroads in southeastern territory, with headquarters at 110 Maple street, Decatur, Ga. Mr. Meyer formerly was with the sales department of the Towmotor Corporation.

◆

NATIONAL MALLEABLE & STEEL CASTINGS CO.—*Mark M. Miller*, formerly assistant sales manager of the Indianapolis, Ind., plant of the National Malleable & Steel Castings Co., has been appointed sales manager of the plant and *John H. Murphy*, formerly a member of the sales department,

X marks the source of a smoother ride



Flexible Control of lateral shocks — another reason why railroads standardize on SOLID JOURNAL BEARINGS

A smooth ride requires control of *lateral* shocks and vibration, as well as *vertical.* That's why nothing equals the smooth ride of the standard truck equipped with A.A.R. Solid Journal Bearings. The Solid Bearing has "built-in flexibility" in the form of lateral clearance . . . normal lateral shocks and vibration are cushioned instead of being rigidly opposed, being contained in the wheel and axle instead of transmitted through the car to the lading. This flexibility is accomplished *without expensive, complicated designs that hamper free interchange of cars.*

The efficient, simple design of the Solid Journal Bearing has made unmatched records of dependable service—*and low cost service.* As a result, they're standard equipment on America's Freight Cars.

More Service-Proved FACTS about Solid Journal Bearings

Unmatched Performance — with as high as 6½ Million bearing miles per car setout.

Easiest to Maintain — replacement takes minutes, without need for skilled labor.

Simple in Design—the only answer to unrestricted interchange.

Lowest Cost—save over 25% on car cost; average only $20.00 per car set in replacement.

Most Liberal Tolerances — axles can be used and re-used with simple roller burnishing.

Lowest Running Friction—a single film of oil permits faster acceleration, lower running resistance — particularly at low temperatures.

Lightest Weight—up to 60% less dead weight than any other type of bearing.

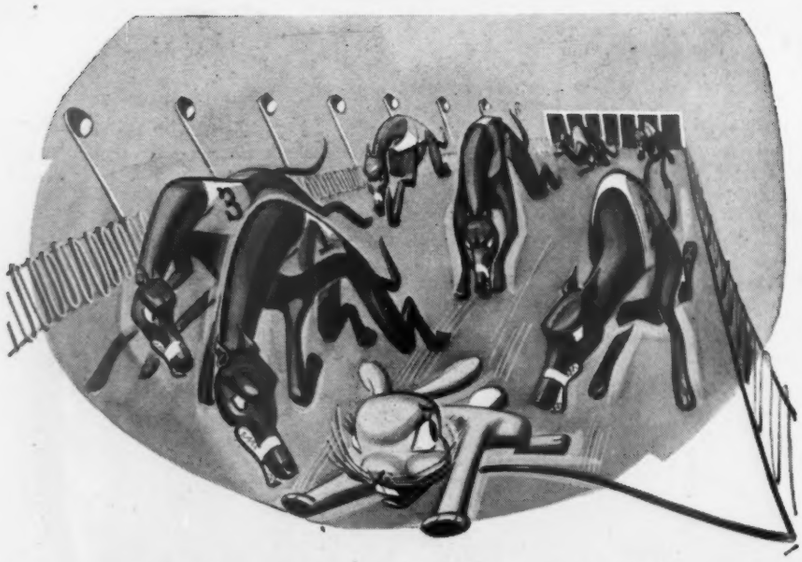
National Bearing Division—Serving America's Railroads Since 1874

AMERICAN Brake Shoe COMPANY

NATIONAL BEARING DIVISION

4938 Manchester Avenue • St. Louis 10, Mo.

PLANTS IN: ST. LOUIS, MO. • MEADVILLE, PA. • NILES, OHIO • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.



Saved... By a Dow Corning Silicone

The pelt of many a mechanical rabbit has been saved by rewinding the motors that drive them with Dow Corning Silicone (Class H) electrical insulation. That's a modern Aesop's fable* uncovered by our Atlanta office.

Here's the moral. When your private or corporate life depends upon continuous operation, specify Dow Corning Silicone insulated motors, generators, transformers or solenoids. The more it costs you to permit a motor to fail, the more imperative it is to prolong the life and to increase the reliability of that motor with Class H insulation made with Dow Corning Silicones.

For about twice the cost, you get ten times the life; for a few hundred dollars, you save several thousand dollars in lost production, man hours of labor, maintenance costs and repair bills.

Write today for more information on how you can keep ahead of the pack with Dow Corning Silicone (Class H) Insulation.

* This fable can be and has been acted upon to save the less expendable hides of some of the most able electrical maintenance engineers.

MAIL THIS COUPON TODAY

DOW CORNING CORPORATION, MIDLAND, MICHIGAN
Please send me more information including list of Class H motor shops and Class H motor manufacturers. S-7

Name_____ Title_____
Company_____
Street_____
City_____ Zone____ State____

FIRST IN SILICONES
DOW CORNING CORPORATION
MIDLAND, MICHIGAN

ATLANTA • CHICAGO • CLEVELAND • DALLAS • LOS ANGELES • NEW YORK
WASHINGTON, D. C. • In CANADA: Fiberglas Canada Ltd., Toronto • In GREAT BRITAIN: Midland Silicones Ltd., London.

has been appointed assistant sales manager. Mr. Miller is succeeding *A. L. McColloum*, who is retiring after more than 30 years of service with the company.

The National Malleable & Steel Castings Co. is beginning a $6,300,000 expansion program which will increase its capacity by about 25 per cent, according to Cleve H. Pomeroy, president. All plants at Cleveland, Chicago, Indianapolis, Sharon, Pa., and Melrose Park, Ill., will share in the improvements. The largest expenditures are planned for the Cleveland works, where an entire new malleable foundry unit will be added. Some equipment will be in operation by mid-year and all improvements should be completed by a year from now.

◆

TIMKEN ROLLER BEARING COMPANY.—*William E. Mott* has been appointed a sales engineer, Railway Division, at the New York office of the Timken Roller Bearing Company.

◆

JOSEPH DIXON CRUCIBLE COMPANY—*Anthony J. Nino, Jr., has* been appointed domestic general sales manager of the Joseph Dixon Crucible Company, with headquarters at Jersey City, N. J. Mr. Zino formerly was assistant to president of Swan-Finch Oil Corporation.

◆

FARR COMPANY.—The Farr Company has moved its main office and production facilities to 2301 East Rosecrans avenue, El Segundo, Cal.; mailing address is P. O. Box 10187, Airport Station, Los Angeles 45. The company's Chicago branch office and warehouse also has moved to larger quarters at 5433 West Belmont avenue.

◆

WILLSON PRODUCTS, INC.—*Thomas A. Willson*, has been elected a vice-president of Willson Products, Inc., Reading, Pa. Mr. Willson will continue also as assistant secretary.

◆

NATIONAL PNEUMATIC COMPANY.—The National-Pneumatic Company has opened an office at 1228 Buhl building Detroit. *T. Austin Casey*, formerly of the Chicago office, has been appointed to take charge of the new Detroit office.

◆

UNION CARBIDE & CARBON CORP.—*Kenneth I. Thompson*, general sales manager of the Oxweld Railroad Service Company, a division of Union Carbide & Carbon Corp., at Chicago, has been elected also a vice-president and director of the Canadian Railroad Service Company, a unit of Union Carbide & Carbon.

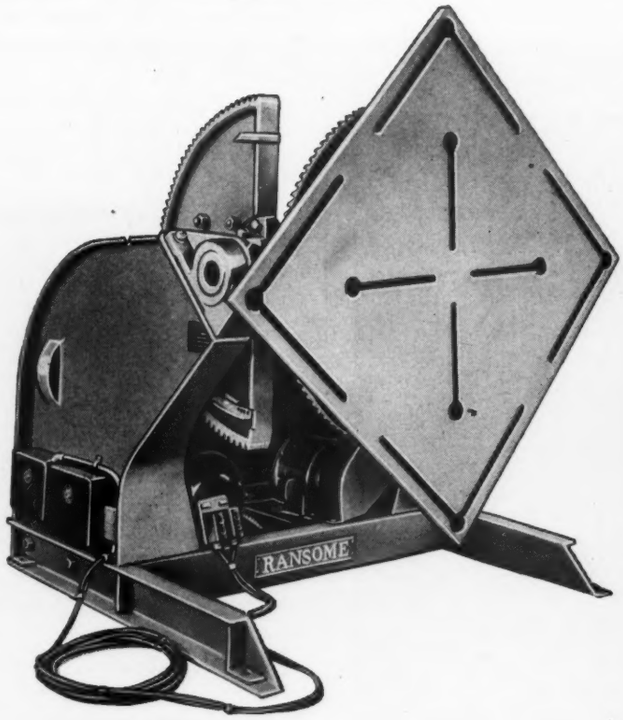
J. V. Condon has been appointed general manager of the *Canadian Railroad Service Company*, a unit of the Union Carbide & Carbon Corp., with headquarters in Toronto, succeeding *H. V. Gigandet*, vice-president, who has retired.

◆

DETREX CORPORATION.—*William F. Lucas* has been appointed as assistant to E. H. Ehlert, western region manager of Detrex Corporation, Detroit, Mich. Mr. Lucas, who will have headquarters in the Chicago office, 600 South Michigan avenue, will supervise the technical applications and the field servicing of Perm-Cote, phosphate-type of rust-proofing compounds, and Detrex alkaline

Lots of Different Pieces or Lots Alike...

THIS POSITIONER PAYS OFF



in more production . . . better welds . . . less rod waste

The universal table top makes the Worthington-Ransome Welding Positioner as profitable on *job* work as it is in mass production.

Those "T" slots make the table adaptable to any shape of work piece and a wide range of sizes. No special jigs or fixtures needed.

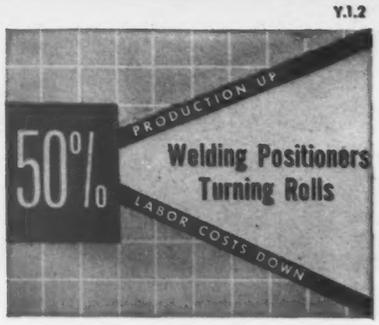
Result—up to 50% more footage, *better* welds (using higher current and heavier rods), less welding rod waste.

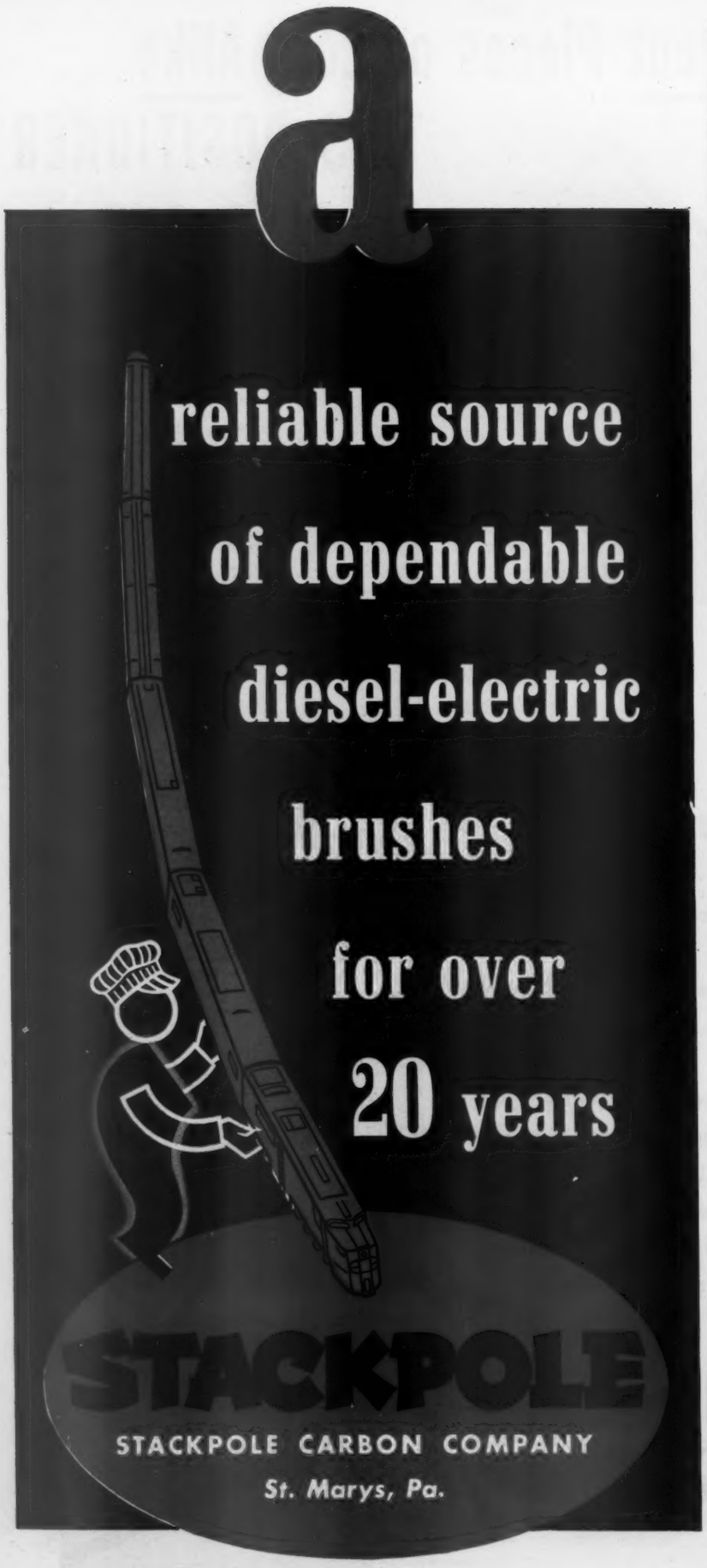
Welding positioner capacities from 100 lb to 30 tons. Also: turning rolls from 3 to 150 tons, stationary or self-propelled.

Write Worthington Pump and Machinery Corporation, Dunellen, New Jersey, for bulletins or additional information.

Y.1.2

WORTHINGTON





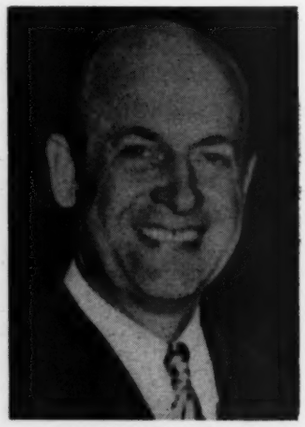
and emulsion cleaners, in Wisconsin and northern Illinois.

◆

NATIONAL STEEL CAR CORPORATION.—*Alex P. Shearwood* has been appointed vice-prsident of the National Steel Car Corporation of Montreal, Que., and Hamilton. Ont.

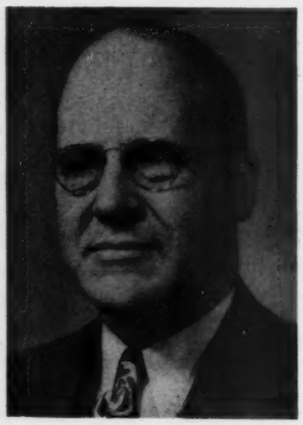
◆

EDGEWATER STEEL COMPANY.—The Edgewater Steel Company has moved its Chicago office to Room 1142, Merchandise Mart Plaza, Chicago 54.



A. J. Couse

A. J. Couse, district manager of Chicago and St. Louis, Mo., territories of Edgewater



D. W. Odione

Steel Company, has been appointed assistant to the vice-president and general sales manager at Pittsburgh, Pa. *D. W. Odiorne*,

W. O. Fleming

"Tailor-made" for Railroad Diesels

Esso Diesel Lubricating Oil

A HIGH-QUALITY LUBE FOR REAL PROTECTION —Esso offers "tailor-made" diesel locomotive lubricating oil (Diol RD) developed through years of field testing and research by both engine designers and Esso scientists to meet needs of railroad diesels. High-quality Esso Diol RD gives dependable lubrication protection.

BACKED BY CONSTANT RESEARCH—continuing tests in the lab and on the road make sure that Diol RD keeps pace with progress and latest developments in railroad diesels.

BACKED BY CONSTANT FOLLOW-UP — on-the-job check-ups by Esso Sales Engineers watch the dependable performance of Esso Railroad Fuels and Lubricants. Be sure to call on Esso for any railroad fuel or lubricating problem.

The Sign of QUALITY — ESSO — *The Symbol of* SERVICE

RAILROAD PRODUCTS

SOLD IN: Maine, N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Penna., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

ESSO STANDARD OIL COMPANY — Boston, Mass. — New York, N. Y. — Elizabeth, N. J. — Philadelphia, Pa. — Baltimore, Md. — Richmond, Va. — Charleston, W. Va. — Charlotte, N. C. — Columbia, S. C. Memphis, Tenn. — New Orleans, La.

railway engineer, succeeds Mr. Couse as district manager. *W. O. Fleming* has been appointed metallurgical engineer and assumes the duties previously handled by Mr. Odiorne.

PERSONAL MENTION

General

F. E. MOLLOY, assistant superintendent motive power of the Southern Pacific, has been appointed to superintendent motive power at the Sacramento, Cal., general shops. Mr. Molloy started service with the S. P. as a machinist at Douglas, Ariz., in 1925 after 12 years' service with other roads. Later he held various positions, including general enginehouse foreman and master mechanic. In 1942 he became assistant superintendent motive power at Los Angeles, Cal., and in 1944 assistant superintendent motive power at Sacramento.

HENRY REDMORE NAYLOR, works manager of the Angus shops of the Canadian Pacific at Montreal, Que., has retired on pension.

H. T. COVER, chief of motive power of the Pennsylvania at Philadelphia, Pa., has been appointed also assistant vice-president in charge of operation. Mr. Cover was born at Altoona, Pa., on August 25, 1897, and attended Pennsylvania State College (B. S. in E. E. 1919). He entered railroad service in August, 1915, with P. R. R. as laborer at Altoona, subsequently serving as boilermaker helper, draftsman, special apprentice, motive-power inspector, assistant shop foreman, shop foreman, assistant master mechanic and master mechanic. In January, 1940, Mr. Cover was appointed superintendent of the Wilkes-Barre division and two years later, superintendent freight transportation at Philadelphia. He was named general superintendent of the Eastern Ohio division at Pittsburgh in August, 1942, and became chief of motive power of the system in March, 1946.

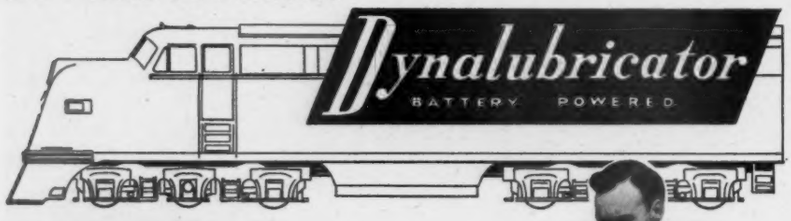
H. T. Cover

F. E. RUSSELL, superintendent motive power of the Sacramento, Cal., general shops of the Southern Pacific, has gone to Washington, D. C., on special assignment as consultant to serve as chief of the roadway, equipment and manpower branch of the Railroad Division, Defense Transportation Administration.

W. W. MATZKE has been appointed to chief mechanical engineer of the Chicago & North Western System, as noted in the June issue, was born on December 28, 1907, at Duluth, and received his bachelor's degree in mechanical engineering

W. W. Matzke

REVOLUTIONARY



PUMPS HEAVIEST GEAR CASE LUBRICANTS

ELIMINATES MESSY HAND-DISPENSING

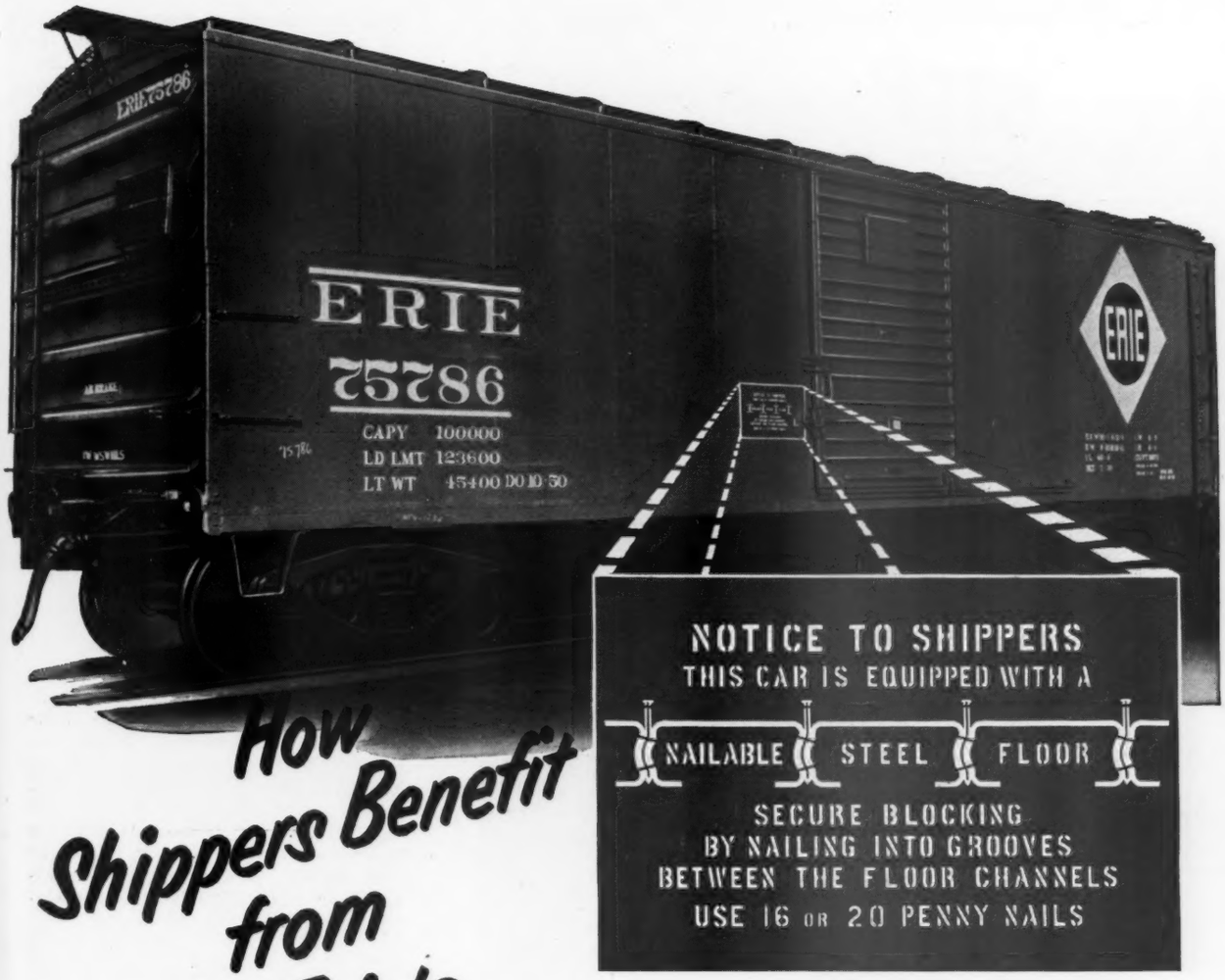
AUTOMATICALLY PUMPS MEASURED AMOUNTS

With the DYNALUBRICATOR modern shops are now servicing every gear case of a 3-unit locomotive *in just 10 minutes! Exact amounts* of lubricant assured by automatic metering and cut-off device. *No-Drip Nozzle* gives convenient, positive control over grease flow, eliminates messy dripping. Lubricants kept at working temperature automatically. Battery power eliminates trailing wires during operation. Easily handled by one man.

Shops now using the Dynalubricator *wouldn't be without it.* Write today for literature and full information.

SOUTHERN SPECIALTIES CO., INC.
202 CODDINGTON BLDG. CHARLOTTE, N. C.

A PRODUCT OF BROWN DYNALUBE MANUFACTURING CO.



How Shippers Benefit from the Erie's Progressiveness

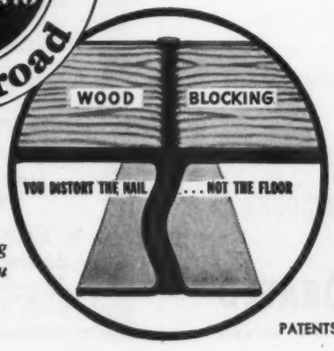
As a new century dawns for the Erie Railroad, its present management looks forward with vigor and vision.

Shippers recognize the Erie's progressiveness, for instance, when they see the NAILABLE STEEL FLOORING stencil on its boxcars and gondolas.

Shippers know that N-S-F and its exclusive nailing feature mean greater security for lading of all kinds—bulk, bagged, boxed or blocked. They know that N-S-F assures effective prevention of loss and damage claims plus greater all-round versatility of rolling stock.

ERIE 1851 100th ANNIVERSARY 1951 Great Lakes to the Sea Erie Railroad

The Erie is one of 40 progressive roads using N-S-F



Greater holding strength when you nail to N-S-F

GREAT LAKES STEEL CORPORATION
Steel Floor Division • Ecorse, Detroit 29, Michigan

PRODUCER OF NAX HIGH-TENSILE STEEL

NATIONAL STEEL CORPORATION

PATENTS PENDING

51-SF-8

Tough, oil-impervious, shock-resistant Neoprene permanently and *inseparably* bonded to steel inserts (dotted lines). Placed in dust-guard well, the *Axle-Stop* restricts journal movement to ⅛ inch!

Here's new **engineered** precision in journal box assembly that promises the first **real** relief from hot box troubles!

Restriction of journal movement is the answer. **Axle-Stop** has had 312,000 miles of service which bears out laboratory and motion-picture findings—that **prevention of axle displacement reduces waste grab, the most common cause of hot boxes!**

axle stop

AXLE-STOP, INCORPORATED

1830 N. Sheffield Avenue, Chicago 14, Illinois

from the Universty of Minnesota in 1929. He began his railroad career with the Duluth, Missabe & Northern (now Duluth, Missabe & Iron Range) during summer vacations, starting to work full time in 1929. From 1934 to 1944 he was associated with the Hartford Steam Boiler Inspection & Insurance Co. Subsequetly he became associated with the North Western and served successively as engineer power plants and machinery, mechanical engineer and assistant to chief mechanical officer.

PATRICK M. SULLIVAN, superintendent, motive power and cars, of the Duluth Missabe & Iron Range, at Proctor, St. Louis, Mo., has retired after 49 years of service on the road.

ROBERT H. SEITZ has been appointed superintendent, motive power and cars, of the Duluth, Missabe & Iron Range, with headquarters at Proctor, St. Louis, Mo.

W. D. DICKIE, assistant works manager, locomotive, of the Angus shops of the Canadian Pacific at Montreal, Que., has been appointed works manager.

Car Department

W. KENDRICK FARMER, whose appointment as mechanical engineer—cars of the Chicago & North Western at Chicago, was reported in the June issue, was born on September 26, 1908, at Louisville, Ky. Mr. Farmer started with the North Western in May, 1927, as a tracer and detailer in the mechanical department. Subsequently he held various positions and prior to becoming mechanical engineer was draftsman-estimator.

Diesel

F. G. BAKER, formerly assistant superintendent of motive power, of the St. Louis-San Francisco, has been placed in charge of a diesel department which has been organized by the Frisco to bring under one head diesel inspection and repair. Assisting Mr. Baker is a general supervisor of diesel maintenance, while diesel supervisors—all newly-created posts—have been assigned to each of the road's seven divisions under supervision of the master mechanic on each division. Under the new department an intensified educaitonal program will be inaugurated to train mechanics at each of the Frisco's diesel shops. Crew instruction will be conducted over the system through a special school car.

G. O. WHITESELL has been appointed diesel supervisor (system) of the Seaboard Air Line, with headquarters at Jacksonville, Fla.

R. W. MURRAY has been appointed diesel instructor of the Seaboard Air Line at Jacksonville, Fla.

Master Mechanics and Road Foremen

H. B. ROBINSON, general foreman, locomotive department, of the Norfolk & Western at Roanoke, Va., has been appointed to the newly created position of assistant master mechanic, Scioto division.

Resident inspector (left) and general inspector (right) checking the records of a day's run in a chilled car wheel plant. The aim is uniformity from plant to plant in making every wheel as good as the best.

One of the duties of the AMCCW general inspector is to check all gages in use by resident inspectors against his master gages. Here he is seen inspecting the flange thickness gage. The chilled car wheels in the background are ready for shipment.

How inspection makes sure chilled car wheels can take it!

Every AMCCW wheel is tested for rotundity. The steel ring shown in photo must fit to .030" of perfection before the wheel is approved for service. If the wheel fails this exacting test, it must be ground to within .015" of perfect rotundity, or half the permissible limit.

Checking begins with the melt—even before an AMCCW wheel is poured. And never lets up until the wheel is okayed for use.

The AMCCW resident inspector in every AMCCW plant keeps elaborate records of every AMCCW wheel made... checks molding methods ... watches pouring temperatures... supervises rotundity tests... selects wheels for the daily drop and thermal tests. He is responsible, too, for all gages and pyrometers used in the plant.

In addition, a general inspector from Association headquarters spends a week every six months in each AMCCW plant, checking inspection methods and equipment, reviewing the records as shown above and checking all operating details that affect wheel quality, from the cupola to the shipping platform.

Accurate and detailed inspection like this, coupled with the new AMCCW wheel, with its heavier rim and stronger flange, means even higher safety records.

AMCCW

Low first cost
Low exchange rates
Reduced inventory
Short haul delivery
Increased ton mileage
High safety standards
Complete AMCCW inspection
Easier shop handling

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

445 North Sacramento Boulevard, Chicago 12, Ill.

American Car & Foundry Co. • Southern Wheel (American Brake Shoe Co.)
Griffin Wheel Co. • Marshall Car Wheel & Foundry Co. • New York Car Wheel Co.
Pullman-Standard Car Mfg. Co.